POULTRY DRY LITTER MANAGEMENT PLAN

This document was developed by the Senate Bill 1217 Interagency Group to assist poultry operations with more than 30,000 birds in meeting the applicable statutes and regulations for dry litter management in North Carolina. Included in this packet are the list of specific requirements, required forms, and general information and worksheets useful in developing a plan.

Poultry manure is an excellent source of nutrients and can be incorporated into most fertilizer programs. Those using manures must practice sound soil fertility management to prevent nutrient imbalances and associated animal health risks, as well as surface-water and groundwater contamination. The key to successful management is to match the nutritional requirements of the crop with nutrients available in the manure. The value of poultry manure varies not only with its nutrient composition and availability, but also with management and handling costs.

The purpose of a manure nutrient utilization plan is to estimate the acres of cropland needed to use the manure nutrients you produce. This manure nutrient utilization plan uses nitrogen as the limiting (priority) nutrient. The plan requires consideration of the realistic yields of the crops you will grow, their nutrient requirements, and proper timing of applications to maximize nutrient uptake. The plan is based on typical manure production rates and average nutrient contents for this type of facility. Your actual production and nutrient values may vary by 20% or more. Do not apply more nitrogen than the crop can use. Implementation of the plan based on actual analysis may require additional acres or reduction in stocking rates to ensure that nutrients are not applied in excess of agronomic rates.

This plan consists of

- Description of your production facility and waste handling method
- Estimate of manure produced on your farm
- Estimate of acres required to use manure nutrients at agronomic rate based on realistic yield expectations
- Required specifications which must be followed

The following records must be maintained for three years:

- Manure nutrients analysis (a waste analysis is required within 60 days of each application)
- Soil test reports (a soil nutrient analysis is required annually for all fields receiving poultry and animal wastes)
- Manure application records indicating the location of fields and rates at which litter is land applied. (See Attached Forms)

If implemented according to these specifications, this manure nutrients management plan meets the requirements for compliance with 15A NCAC 2H.0217 adopted by the Environmental Management Commission and Senate Bill 1217 ratified by the North Carolina General Assembly on June 21, 1996.

Instruction for use of these guidelines are as follows:

- Page 3 provides a cover for the plan which includes basic information specific to each individual operation.

- Page 4 lists the required specifications for dry litter plans which are necessary for compliance with 15A NCAC 2H.0217 adopted by the Environmental Management Commission and Senate Bill 1217 ratified by the North Carolina General Assembly.

- Page 5 is an agreement used for sharing responsibility for development and implementation of the dry litter plan.

- Page 6 is an agreement between the poultry operator and the owner of land leased by the poultry operator on which waste is applied.

- Page 7 is an agreement between the poultry operator and a third party applicator who removes the litter and applies it to land not owned or leased by the operator.

- Page 15 is Form DRY-1 which must be by the owner to record litter cleanout

- Page 16 and 17 are Forms DRY-2 and DRY-3 which are application and nitrogen balance records. The poultry operator is responsible for keeping those records where litter is applied to land he owns or leases. The third party applicator should maintain these records for litter he handles.

When a third party applicator handles litter, the poultry operator must provide the waste analysis and the third party applicator has responsibility to meet all other requirements including application at agronomic rates, soil testing, field evaluations, etc.

POULTRY DRY LITTER MANAGEMENT PLAN

Existing or New or Expanded (please circle one)

General Information:

Name of Farm: _____

Land Owner(s) Name: _____ Phone No: _____

Mailing Address: _____

_____

_____

County: _____

Operation Description:

Type of Poultry	*No. of Animals*	*Type of Poultry*	*No. of Animals*
❒ Turkey		❒ Broiler	
❒ Turkey Breeder		❒ Broiler Roaster	
❒ Turkey Brooder (Poult)		❒ Broiler Breeder	
❒ Turkey Grower Hen		❒ Pullets	
❒ Turkey Grower Tom		❒ Other	

Manure Handling Method:	*Quantity of Litter Produced*	*Total Litter Produced*
❒ Whole Litter		
❒ Manure Cake		
❒ Stockpiled Litter		

I (we) verify that all the above information is correct and will be updated upon changing. I (we) understand the operation and maintenance procedures established in the dry litter management plan for the farm named above and will implement these procedures. I (we) know that any expansion to the existing design capacity of the waste treatment and storage system or construction of new facilities will require a new dry litter management plan to be completed. I (we) understand that the animal waste application program shall be effectively maintained and operated as a non-discharge system to prevent the discharge of waste to surface waters, wetlands or surface water drainage systems (except for storm events exceeding the 25-year, 24-hour storm). The producer/third party applicator must report by telephone to the appropriate Division of Water Quality (DWQ) Regional Office as soon as possible but in no case more than 24 hours or the next business day following the occurrence or first knowledge of the occurrence of any failure of the animal waste system or transport system that results in a discharge to the surface waters of the state or an over application of waste. (See the attached map for the regions covered by each DWQ regional office). Compliance with the recommendations contained in this plan is the sole responsibility of the farmer/third party applicator. Any questions concerning the enforcement of this plan should be addressed to the regional office of the North Carolina Department of Environment, Health and Natural Resources, Division of Water Quality, Water Quality Section (see attached map).

Name of Land Owner: _____

Signature: _____ **Date:** _____

Name of Producer/Manager (if different from owner)**:** _____

Signature: _____ **Date:** _____

Preparation Assistance by[†]**:** _____ **Date:** _____

Address: _____ **Phone:** _____

[†] If technical assistance is provided in the development of this plan, the person providing assistance should sign the form.

Required Specifications

1. Dry litter will be sampled as close to the time of application as practical but at least within 60 days of land application for waste analysis. The state average N content for dry litter as shown in the *North Carolina Agricultural Chemical Manual* published annually by NCSU may be used to calculate application rates in lieu of individual waste analysis; however, waste analysis is still required. For more information about proper procedures for sampling manure for nutrient analysis, see Cooperative Extension Service publication number AG-439-33, *SoilFacts: Waste Analysis*.

2. Litter will not be stockpiled within 100 feet of perennial streams or groundwater wells.

3. Soils from fields receiving poultry litter applications will be sampled annually for a standard soil fertility analysis. For more information about proper procedures for sampling manure for nutrient analysis, see Cooperative Extension Service publication number AG-439-30, *SoilFacts: Careful Soil Sampling—The Key to Reliable Soil Test Information*.

4. Lime will be applied in accordance with the standard soil test report to assure suitable conditions for crop growth.

5. Alternate fields will be used for land application of litter should soil copper and zinc concentrations reach a level that is potentially harmful to the receiving crop. For more information about excessive soil copper and zinc levels, contact a technical specialist that works for the Cooperative Extension Service, Natural Resources Conservation Service, North Carolina Department of Agriculture or the local Soil and Water Conservation District.

6. Litter will be applied at rates not to exceed the agronomic nitrogen rate of the receiving crop. Rates should be based on NCDA soil test recommendations or alternatives given in NRCS standards, such as realistic yield expectations. For more information about realistic yield expectations, contact a technical specialist that works for the Cooperative Extension Service, Natural Resources Conservation Service, North Carolina Department of Agriculture or the local Soil and Water Conservation District.

7. Record Keeping for Land Application:
   a. Records will be kept for three years of soil test and waste analysis results.
   b. Records will be kept for three years indicating the location of fields and rates at which litter is land applied. (See Attached Forms DRY -2 and DRY-3)

8. If a third party contractor is used for cleanout of the poultry houses and/or land application, the owner/manager of the poultry operation will:
   a. Keep a record of the name, address and phone number of applicator (See Third Party Applicator Agreement)
   b. Keep a record of the amount of litter removed (Form DRY-1)
   c. Provide an appropriate waste analysis to the third party applicator
   d. Provide a copy of these guidelines to the third party applicator.

Best management practices may be used to further protect water quality. For more information about appropriate best management practices contact a technical specialist that works for the Cooperative Extension Service, Natural Resources Conservation Service, North Carolina Department of Agriculture or the local Soil and Water Conservation District.

EXAMPLE SHARED RESPONSIBILITY AGREEMENT FOR LAND APPLICATION OF POULTRY LITTER

I. The conditions listed below are required by the State of North Carolina to protect water quality. These conditions apply to litter removed from operations with housing capacity for more than 30,000 birds. The poultry litter covered by this agreement was removed on _____ 199___ from the poultry operation owned by _____ located at _____i n _____ County.

a. The litter must be managed to ensure that there is no discharge of the litter to the surface waters.

b. Litter will not be stockpiled within 100 feet of perennial streams or wells.

c. Waste sampling and providing a copy of the waste analysis to the applicator is the responsibility of the producer. This information will be used in determining the application rate. The applicator will provide the waste analysis to the landowner or land user as appropriate. The state average N content for dry litter as shown in the *North Carolina Agricultural Chemical Manual,* published annually by NCSU, may be used to calculate application rates in lieu of individual waste analysis; however, waste analysis is still required.

d. Application rates will be calculated to not exceed the agronomic nitrogen needs of the receiving crop.

e. Litter will be applied at rates not to exceed the agronomic nitrogen rate of the receiving crop.

f. Soils from fields receiving poultry litter will be sampled annually.

g. Soil pH for all fields on which litter is applied will be maintained in accordance with the standard soil test report recommendations.

h. Should soil copper and zinc concentrations reach a level that is potentially harmful to the receiving crop (above 700 on the NCDA soil test report), the land owner or land user should contact a qualified specialists to discuss options for future applications of litter.

i. Record keeping for land application.

1) Records will be kept for three years of soil test and waste analysis.
2) Records will be kept for three years indicating the location of fields and rates at which litter is land applied.

II. I the landowner or land user of fields where litter is applied accept responsibility for items a, b, h and _____ from part I.

_____ _____
Print Name Phone Number

_____ _____
Signature Date

III. I the applicator agree to meet items a, b and all remaining conditions not accepted by the landowner or landuser in Part II above.

_____ _____
Print Name Phone Number

_____ _____
Signature Date

Dry Litter Utilization Agreement for Leased Land (Example)

I, _____ hereby give _____ permission to apply waste from his poultry production facility on _____ acres of my land for the duration of the time shown below.

I understand that this manure contains nitrogen, phosphorus, potassium and trace elements, and when properly applied should not harm my land or crops. I also understand that the use of animal manure will reduce my need for commercial fertilizer.

Adjacent Landowner: _____ Date: _____

Manure Producer: _____ Date: _____

Technical Representatives: _____ Date: _____

Term of Agreement : _____,19___ to _____, ____.

Dry Litter Utilization - Third Party Applicator Agreement (Example)

I, _____ hereby acknowledge that I have received a copy, have read and understand the Dry Litter Management Plan dated _____ that was developed for/by _____ for their facility located at _____ _____ in _____ County.

I hereby agree to manage and land apply the dry poultry litter that I received from this facility in a manner consistent with the requirements of this Dry Litter Management Plan and keep copies of all required records as specified in the Plan. Furthermore, should I choose to use and an alternative waste utilization system, such as composting and marketing, the Department of Environment, Health and Natural Resources, Division of Water Quality Regional Office must be notified in writing.

Third Party Receiver: _____ Date: _____

Manure Producer: _____ Date: _____

Technical Representatives: _____ Date: _____

Term of Agreement : _____,19___ to _____, ____.

Worksheet: Crop Nutrient Requirement Worksheet. ***Use one worksheet per crop.***		
	Example	**Your Farm**
1. Crop to be grown	Corn	
2. Crop realistic yield expectation from NRCS standards or farm records	110 bu/acre	
3. Nitrogen fertilization guidelines per unit of yield (see Table 1)	1.0 lb N/bu	
4. Crop Nitrogen requirement (2 × 3)	110 lb N/acre	
5. Starter fertilizer nitrogen	25 lb N/acre	
6. Commercial fertilizer	0 lb N/acre	
7. Crop Nitrogen need from poultry dry litter minus 5 minus 6)	85 lb N/acre	
8. Poultry dry litter Plant-Available Nitrogen (*Note:* If using an NCDA Waste Analysis, skip to 8c. [1])		
a) Total nitrogen composition of litter from farm average [2], or state average as shown in the *NC Agricultural Chemical Manual*.	38 lb TN/ton	
b) Nitrogen availability coefficient (see Table 2).	0.5	
c) Plant-available nitrogen (a × b) or from Waste Analysis.	19 lb N/ton	
9. Poultry dry litter application rate (7 ÷ 8)	4.5 ton/acre	
10. Acres of crop to be grown	95 acres	
11. Total litter required to meet the agronomic N requirement for this field (9 × 10)	427.5 tons	

[1] Waste analysis is required within 60 days of land application.

[2] Litter application rates can be based on average nutrient content values for the farm provided the waste samples required to be taken are used in the development of the average values.

Table 1. Nitrogen Fertilization Guidelines per Unit of Realistic Yield	
Commodity	**lb N/Realistic Yield Expectation**
Corn (grain)	1.0 to 1.25 lb N/bu
Wheat (grain)	1.7 to 2.4 lb N/bu
Rye (grain)	1.7 to 2.4 lb N/bu
Oats (grain)	1.0 to 1.3 lb N/bu
Barley (grain)	1.4 to 1.6 lb N/bu
Soybean (grain)	3.5 to 4.0 lb N/bu
Triticale (grain)	1.4 to 1.6 lb N/bu
Sorghum (grain)	2.0 to 2.5 lb N/cwt
Corn (silage)	10 to 12 lb N/ton
Sorghum-sudangrass (hay [1])	45 to 55 lb N/dry ton
Pearl Millet (hay [1])	45 to 55 lb N/dry ton
Bermudagrass (hay [1]) *all areas of the state*	40 to 50 lb N/dry ton
Tall fescue (hay [1])	40 to 50 lb N/dry ton
Orchard grass (hay [1])	40 to 50 lb N/dry ton
Timothy (hay [1])	40 to 50 lb N/dry ton
Small grain (hay [1])	50 to 60 lb N/dry ton
Cotton	0.06 to 0.12 lb N/lb lint
Pine trees	40 to 60 lb N/acre/year
Hardwood trees	70 to 100 lb N/acre/year
[1] Reduce N rate by 25 percent when grazing.	

Table 2. First year nitrogen availability coefficients for poultry litter.	
Application Method	**Nitrogen Availability Coefficient**
Broadcast -unincorporated	0.5
Broadcast - incorporated	0.6

Worksheet for Calculating Poultry Litter Production

The total amount of litter removed from farm production facilities can be estimated by the following method. The amount is somewhat dependent on the type and amount of litter added initially and may vary by as much as 20% depending on the farm practices.

Broiler House Litter	**Typical**	**Actual**
a. Number of birds per flock:	25000	
b. Number of flocks per year:	5.8	
c. Pounds market live weight per bird:	4	
d. Tons litter per 1000 birds per flock:	1	
e. Tons litter per year (a x b x d ÷ 1000) :	145	

Broiler House Manure Cake	**Typical**	**Actual**
a. Number of birds per flock:	25000	
b. Number of flocks per year:	5.8	
c. Pounds market live weight per bird:	4	
d. Tons cake per 1000 birds per flock:	0.34	
e. Tons cake per year (a x b x d ÷ 1000) :	50	

Broiler Stockpiled Litter	**Typical**	**Actual**
a. Number of birds per flock:	25000	
b. Number of flocks per year:	5.8	
c. Pounds market live weight per bird:	4	
d. Tons litter per 1000 birds per flock:	1	
e. Tons litter per year (a x b x d ÷ 1000) :	145	

Broiler Roaster House Whole Litter	Typical	Actual
a. Number of birds per flock:	12500	
b. Number of flocks per year:	4	
c. Pounds market live weight per bird:	8	
d. Tons litter per 1000 birds per flock:	2.6	
e. Tons litter per year (a x b x d ÷ 1000) :	130	

Broiler Breeder House Whole Litter	Typical	Actual
a. Number of birds production facility capacity:	8000	
b. Days per year birds in production facility:	365	
c. Pounds market live weight per bird:	6	
d. Pounds litter per 1000 birds per day:	131	
e. Tons litter per 1000 bird capacity per year: (b x d ÷ 2000)	24	
f. Tons litter per year (a x e ÷ 1000) :	192	

Turkey Brooder (Poult) House Whole Litter	Typical	Actual
a. Number of birds per flock:	20000	
b. Number of flocks per year:	7	
c. Average pounds market live weight per bird:	2.5	
d. Tons litter per 1000 birds per flock:	.75	
e. Tons litter per year (a x b x d ÷ 1000) :	105	

Turkey Grower Hen House Whole Litter	Typical	Actual
a. Number of birds per flock:	12000	
b. Number of flocks per year:	3.4	
c. Pounds market live weight per bird:	16	
d. Tons litter per 1000 birds per flock:	5	
e. Tons litter per year (a x b x d ÷ 1000) :	204	

Turkey Grower Hen House Manure Cake	Typical	Actual
a. Number of birds per flock:	12000	
b. Number of flocks per year:	3.4	
c. Pounds market live weight per bird:	16	
d. Tons cake per 1000 birds per flock:	1.7	
e. Tons cake per year (a x b x d ÷ 1000) :	70	

Turkey Grower Tom House Whole Litter	Typical	Actual
a. Number of birds per flock:	8000	
b. Number of flocks per year:	3.4	
c. Pounds market live weight per bird:	25	
d. Tons litter per 1000 birds per flock:	7.5	
e. Tons litter per year (a x b x d ÷ 1000) :	204	

Turkey Grower Tom House Manure Cake	Typical	Actual
a. Number of birds per flock:	8000	
b. Number of flocks per year:	3.4	
c. Pounds market live weight per bird:	25	
d. Tons cake per 1000 birds per flock:	2.5	
e. Tons cake per year (a x b x d ÷ 1000) :	70	

Turkey Stockpiled Litter	Typical	Actual
a. Number of birds per flock:	8000	
b. Number of flocks per year:	3.4	
c. Pounds market live weight per bird:	25	
d. Tons litter per 1000 birds per flock:	6.6	
e. Tons litter per year (a x b x d ÷ 1000) :	180	

Turkey Breeder House Whole Litter	Typical	Actual
a. Number of birds production facility capacity:	6000	
b. Days per year birds in production facility:	365	
c. Pounds live weight per bird:	20	
d. Pounds litter per 1000 birds per day:	204	
e. Tons litter per 1000 bird capacity per year: (b x d ÷ 2000)	37	
f. Tons litter per year (a x e ÷ 1000) :	222	

Optional Worksheet for Balancing Poultry Dry Litter Production and Utilization - Includes Land Owned and Leased by the Farmer

(1)	(2)	(3)	(4)	(5)
Farm/Field /Tract	**Acre [1]**	**Crop**	**Dry Litter Application Rate [2]**	**Manure Applied to Field (2) × (5)**
			tons/acre	tons
Dry Litter Application Balance			**Total Dry Litter Applied, tons**	
			Total Dry Litter Produced, tons [3]	
			Balance tons	

[1] From Crop Nutrient Requirement Worksheet
[2] From Crop Nutrient Requirement Worksheet
[3] From Row (a) of Worksheet: On-Farm Plant Available Poultry Manure Nutrients Produced

CALIBRATION OF MANURE SPREADERS

Effective utilization of manure is not possible if you do not know how much is being spread over a given area. Calibration of your spreader is a simple and effective way of improving utilization of nutrients in manure more effectively. Only by knowing the application rate of your spreader can you correctly apply manure to correspond to your crop needs and prevent water quality problems through the over application of animal manure.

Applicators can apply manure, at varying rates and patterns, depending on forward travel and/or PTO speed, gear box settings, gate openings, operating pressures, spread widths and overlaps. Calibration defines the combination of settings and travel speed needed to apply manure, bedding or wastewater at a desired rate and to ensure uniform application.

Spreader Capacity

Liquid spreader capacities are normally rated by the manufacturer in gallons. Multiply by 0.0042 to get tons.

Solid and semi-solid spreaders are rated by the manufacturer either in bushels or cubic feet (multiply bushels by 1.24 to get cubic feet). Most spreaders have two rating capacities: (1) struck or level full, and (2) heaped. Calibration of solid manure spreaders based on its capacity (volume) is difficult to estimate accurately because the density of solid and semi-solid manures are quite variable. Density is the weight of the manure per volume of manure (pounds per cubic foot). Manure density varies depending on the type and amount of bedding used as well as its storage method. Therefore, if you estimate spreader application rates as the volume of the manure the spreader holds you are overlooking the fact that some manure weighs more than other manure. This can cause a significant error when calculating manure application rates.

Since manures and litters have different densities, an on-farm test should be done. To determine the load (tons) of a manure spreader:

1. Weigh an empty 5-gallon bucket.

2. Fill the bucket level full with the material to be spread. Do not pack the material in the bucket but ensure that it settles similar to a loaded spreader.

3. Weigh the bucket again. Subtract the empty bucket weight from this weight to calculate the weight of the contents.

4. Multiply weight of contents by 1.5 to calculate pounds per cubic feet, density.

5. Multiply the manure density by the cubic feet capacity of the spreader and divide by 2000 to get the tons of material in a spreader load.

$$\text{Spreader load (tons)} = \frac{\text{weight of 5 gal manure} \times 1.5 \times \text{spreader capacity (ft}^3\text{)}}{2000}$$

Solid and Semi-Solid Manure Spreaders

In order to calibrate a spreader for solid manure (20 percent or more solids), the following materials are needed:

1. Bucket

2. Plastic sheet, tarp or old bedsheet. An even size, 8 feet by 8 feet, 10 feet by 10 feet, or 12 feet by 12 feet, will make calculations easier.

3. Scales

Calibration method:

1. Locate a large and reasonably smooth, flat area where manure can be applied.

2. Spread the plastic sheet, tarp or bed sheet smoothly and evenly on the ground.

3. Fill the spreader with manure to the normal operating level. Drive the spreader at the normal application speed toward the sheet spread on the ground, allowing the manure to begin leaving the spreader at an even, normal rate.

4. Drive over the sheet at the normal application speed and settings while continuing to apply manure. If a rear discharge spreader is used, three passes should be made: first, drive directly over the center of the sheet, the other two on opposite sides of the center at the normal spreader spacing overlap.

5. Weigh the empty bucket and plastic sheet, tarp, or blanket.

6. Collect all manure spread on the sheet and place it into the bucket.

7. Weigh bucket and manure and subtract the weight of the empty bucket and ground sheet. This will give you the pounds of manure applied to the sheet.

8. Repeat the procedure three times to get a reliable average.

9. Determine the average weight of the three manure applications.

10. Calculate the application rate using the following formula or Table 5-8:

$$\text{Application rate (tons/acre)} = \frac{\text{lb manure collected} \times 21.78}{\text{sheet length (ft)} \times \text{sheet width (ft)}}$$

11. Repeat the procedure at different speeds and/or spreader settings until the desired application rate is achieved.

Example:

What is the application rate (tons per acre) if you collect 8.5 pounds of manure on a 10-foot by 10-foot tarp during a calibration run?

$$\text{Application rate (tons/acre)} = \frac{8.5 \text{ lb manure} \times 21.78}{10 \text{ ft} \times 10 \text{ ft}} = 1.85 \text{ tons/acre}$$

Table 5-8. Calibration of Solid Manure Spreaders

Pounds of Manure Applied to Sheet	Tons of Manure Applied/Acre		
	Size of Ground Sheet		
	8' × 8'	10' × 10'	12' × 12'
1	0.34	0.22	0.15
2	0.68	0.44	0.30
3	1.02	0.65	0.45
4	1.36	0.87	0.61
5	1.70	1.09	0.76
6	2.04	1.31	0.91
7	2.38	1.52	1.06
8	2.72	1.74	1.21
9	3.06	1.96	1.36
10	3.40	2.18	1.51
15	5.10	3.27	2.27
20	6.81	4.36	3.03

Many times it may be necessary to adjust the rate in which waste is applied from the way it is normally spread. Changes in application rate can easily be done by increasing or decreasing the speed in which the waste is being applied. In order to perform these calculations, the spreader load (tons), duration of application (minutes), and the average width (feet) of a normal application needs to be known. The application rate and travel speed can be found using the following equations:

$$\text{Application rate (tons/acre)} = \frac{\text{spreader load (tons)} \times 495}{\text{time (min)} \times \text{width (ft)} \times \text{travel speed (mph)}}$$

$$\text{Travel speed (mph)} = \frac{\text{spreader load (tons)} \times 495}{\text{time (min)} \times \text{width (ft)} \times \text{application rate (tons/acre)}}$$

Example:

What speed should you run if you wish to apply 4 tons of manure per acre with a 3-ton spreader? Your spreader application width is 20 feet and your spreader empties in 6 minutes.

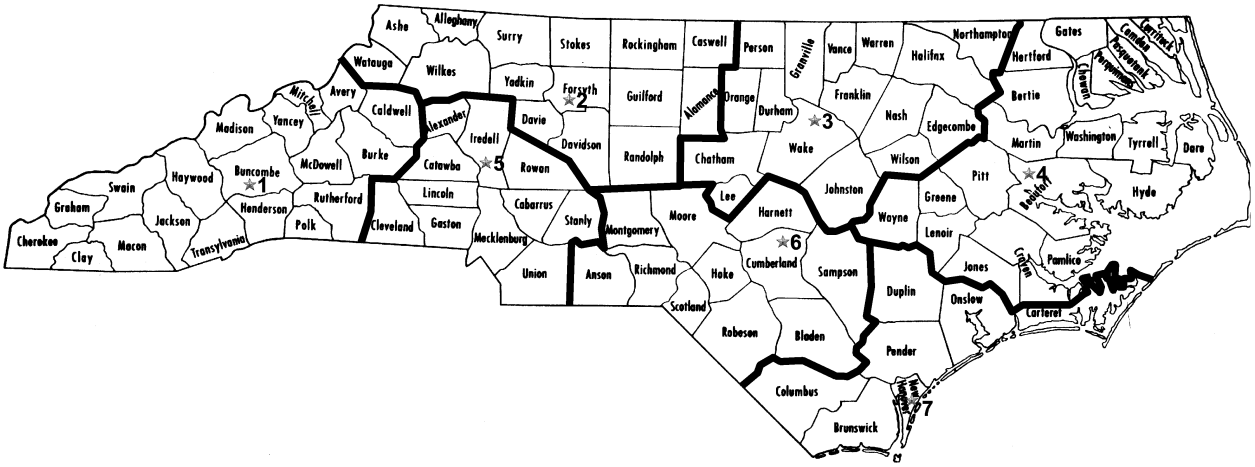
$$\text{Travel speed (mph)} = \frac{3 \text{ tons} \times 495}{6 \text{ min} \times 20 \text{ ft} \times 4 \text{ tons/acre}} = 3.1 \text{ mph}$$

Spreader Pattern Uniformity

To determine the uniformity of spread and the amount of overlap needed, place a line of small pans or trays equally spaced (2 to 4 feet) across the spreader path. The pans should be a minimum of 12 inches by 12 inches (or 15 inches in diameter), but no more than 24 inches by 24 inches; and 2 inches to 4 inches deep. Make one spreading pass directly over the center pan. Weigh the contents caught in each pan or pour the contents into equally sized glass cylinders or clear plastic tubes and compare the amount in each.

The effective spread width can be found by locating the point on either side of the path center where manure contents caught in the containers is half of what it is in the center. The distance between these points is the effective spreader width. The outer fringes of the coverage area beyond these points should be overlapped on the next path to ensure a uniform rate over the entire field. "Flat-top," "pyramid," or "oval" patterns are most desirable and give the most uniform application. "M," "W," "steeple," or "lopside" patterns are not satisfactory and one or more of the spreader adjustments should be made.

Following is a list of the DEHNR-Division of Water Quality regional offices along with a map showing the counties under the jurisdiction of each regional office.



1. **Asheville Regional Office:**

   59 Woodfin Place, Asheville, NC 28801; 704-251-6208; FAX 704-251-6098

2. **Winston-Salem Regional Office:**

   585 Waughtown Street, Winston-Salem, NC 27107; 910-771-4600; FAX 910-771-4631

3. **Raleigh Regional Office:**

   3800 Barrett Drive, Raleigh, NC 27609; 919-571-4700; FAX 919-571-4718

4. **Washington Regional Office:**

   1424 Carolina Avenue, Washington, NC 27889; 919-946-6481; FAX 919-975-3716

5. **Mooresville Regional Office:**

   919 North Main Street, Mooresville, NC 28115; 704-663-1699; FAX 704-663-6040

6. **Fayetteville Regional Office:**

   Wachovia building, Suite 714, Fayetteville, NC 28301; 910-486-1541; FAX 910-486-0707

7. **Wilmington Regional Office:**

   127 Cardinal, Wilmington, NC 28405-3845; 910-395-3900; FAX 910-350-2004