

Facility Number 71 - 17

- Division of Water Quality
- Division of Soil and Water Conservation
- Other Agency _____

Type of Visit Compliance Inspection Operation Review Structure Evaluation Technical Assistance
 Reason for Visit Routine Complaint Follow up Referral Emergency Other Denied Access

Date of Visit: 9-30-04 Arrival Time: 10:30 Departure Time: 11:00 County: Polk Region: West

Farm Name: Pridgen #4 Owner Email: _____

Owner Name: _____ Phone: _____

Mailing Address: _____

Physical Address: _____

Facility Contact: _____ Title: _____ Phone No: _____

Onsite Representative: _____ Integrator: MB

Certified Operator: _____ Operator Certification Number: _____

Back-up Operator: _____ Back-up Certification Number: _____

Location of Farm: Latitude: ° ′ ″ Longitude: ° ′ ″

Empty box with up/down arrows on the right side.

| Swine | Design Capacity | Current Population | Wet Poultry | Design Capacity | Current Population | Cattle | Design Capacity | Current Population |
|---|-----------------|--------------------|--|-----------------|--------------------|---|-----------------|--------------------|
| <input type="checkbox"/> Wean to Finish | | | <input type="checkbox"/> Layer | | | <input type="checkbox"/> Dairy Cow | | |
| <input type="checkbox"/> Wean to Feeder | | | <input type="checkbox"/> Non-Layer | | | <input type="checkbox"/> Dairy Calf | | |
| <input type="checkbox"/> Feeder to Finish | | | Dry Poultry | | | <input type="checkbox"/> Dairy Heifer | | |
| <input type="checkbox"/> Farrow to Wean | | | | | | <input type="checkbox"/> Layers | | |
| <input type="checkbox"/> Farrow to Feeder | | | <input type="checkbox"/> Non-Layers | | | <input type="checkbox"/> Non-Dairy | | |
| <input type="checkbox"/> Farrow to Finish | | | <input type="checkbox"/> Pullets | | | <input type="checkbox"/> Beef Stocker | | |
| <input type="checkbox"/> Gilts | | | <input type="checkbox"/> Turkeys | | | <input type="checkbox"/> Beef Feeder | | |
| <input type="checkbox"/> Boars | | | <input type="checkbox"/> Turkey Poults | | | <input type="checkbox"/> Beef Brood Cow | | |
| Other | | | <input type="checkbox"/> Other | | | Number of Structures: <u>1</u> | | |
| <input type="checkbox"/> Other | | | | | | | | |

Discharges & Stream Impacts

- Is any discharge observed from any part of the operation? Yes No NA NE
 Discharge originated at: Structure Application Field Other
 - Was the conveyance man-made? Yes No NA NE
 - Did the discharge reach waters of the State? (If yes, notify DWQ) Yes No NA NE
 - What is the estimated volume that reached waters of the State (gallons)?
 - Does discharge bypass the waste management system? (If yes, notify DWQ) Yes No NA NE
- Is there evidence of a past discharge from any part of the operation? Yes No NA NE
- Were there any adverse impacts or potential adverse impacts to the Waters of the State other than from a discharge? Yes No NA NE

12/28/04 Continued

Facility Number: 71-17

Date of Inspection 9-30-04

Waste Collection & Treatment

4. Is storage capacity (structural plus storm storage plus heavy rainfall) less than adequate? Yes No NA NE

a. If yes, is waste level into the structural freeboard? Yes No NA NE

Structure 1 Structure 2 Structure 3 Structure 4 Structure 5 Structure 6

Identifier: _____

Spillway?: _____

Designed Freeboard (in): _____

Observed Freeboard (in): 20

5. Are there any immediate threats to the integrity of any of the structures observed? (ie/ large trees, severe erosion, seepage, etc.) Yes No NA NE

6. Are there structures on-site which are not properly addressed and/or managed through a waste management or closure plan? Yes No NA NE

If any of questions 4-6 were answered yes, and the situation poses an immediate public health or environmental threat, notify DWQ

7. Do any of the structures need maintenance or improvement? Yes No NA NE

8. Do any of the structures lack adequate markers as required by the permit? (Not applicable to roofed pits, dry stacks and/or wet stacks) Yes No NA NE

9. Does any part of the waste management system other than the waste structures require maintenance or improvement? Yes No NA NE

Waste Application

10. Are there any required buffers, setbacks, or compliance alternatives that need maintenance/improvement? Yes No NA NE

11. Is there evidence of incorrect application? If yes, check the appropriate box below. Yes No NA NE

- Excessive Ponding Hydraulic Overload Frozen Ground Heavy Metals (Cu, Zn, etc.)
- PAN PAN > 10% or 10 lbs Total Phosphorus Failure to Incorporate Manure/Sludge into Bare Soil
- Outside of Acceptable Crop Window Evidence of Wind Drift Application Outside of Area

12. Crop type(s) CBD SLO Fessie

13. Soil type(s) CoA NoA

14. Do the receiving crops differ from those designated in the CAWMP? Yes No NA NE

15. Does the receiving crop and/or land application site need improvement? Yes No NA NE

16. Did the facility fail to secure and/or operate per the irrigation design or wettable acre determination? Yes No NA NE

17. Does the facility lack adequate acreage for land application? Yes No NA NE

18. Is there a lack of properly operating waste application equipment? Yes No NA NE

Comments (refer to question #): Explain any YES answers and/or any recommendations or any other comments. Use drawings of facility to better explain situations. (use additional pages as necessary):

Reviewer/Inspector Name Will Kunkle

Phone: 910-512-2989

Reviewer/Inspector Signature: [Signature]

Date: 9-30-04

Facility Number: 71 - 17

Date of Inspection 9-30-04

Required Records & Documents

- 19. Did the facility fail to have Certificate of Coverage & Permit readily available? Yes No NA NE
- 20. Does the facility fail to have all components of the CAWMP readily available? If yes, check the appropriate box. WUP Checklists Design Maps Other Yes No NA NE
- 21. Does record keeping need improvement? If yes, check the appropriate box below. Yes No NA NE
 Waste Application Weekly Freeboard Waste Analysis Soil Analysis Waste Transfers Annual Certification
 Rainfall Stocking Crop Yield 120 Minute Inspections Monthly and 1" Rain Inspections Weather Code
- 22. Did the facility fail to install and maintain a rain gauge? Yes No NA NE
- 23. If selected, did the facility fail to install and maintain rainbreakers on irrigation equipment? Yes No NA NE
- 24. Did the facility fail to calibrate waste application equipment as required by the permit? Yes No NA NE
- 25. Did the facility fail to conduct a sludge survey as required by the permit? Yes No NA NE
- 26. Did the facility fail to have an actively certified operator in charge? Yes No NA NE
- 27. Did the facility fail to secure a phosphorus loss assessment (PLAT) certification? Yes No NA NE

Other Issues

- 28. Were any additional problems noted which cause non-compliance of the permit or CAWMP? Yes No NA NE
- 29. Did the facility fail to properly dispose of dead animals within 24 hours and/or document and report the mortality rates that were higher than normal? Yes No NA NE
- 30. At the time of the inspection did the facility pose an odor or air quality concern? If yes, contact a regional Air Quality representative immediately Yes No NA NE
- 31. Did the facility fail to notify the regional office of emergency situations as required by General Permit? (ie/ discharge, freeboard problems, over application) Yes No NA NE
- 32. Did Reviewer/Inspector fail to discuss review/inspection with an on-site representative? Yes No NA NE
- 33. Does facility require a follow-up visit by same agency? Yes No NA NE

Additional Comments and/or Drawings:

(24) Missing
 (28) Should arrive soon.

Pump Lagoons!

(33) Will check liquor level in a few days.

12/28/04

A Comparison of PAN and P₂O₅ produced from Poultry, Swine and Cattle Operations in North Carolina

Introduction

The basinwide planning program within Department of Environmental Quality's Division of Water Resources (DEQ DWR) is charged with identifying and providing recommendations for improving water quality based on the cumulative impacts of all activities across a river basin (G.S. 143-215.8B). Point and nonpoint sources of pollution are to equitably share responsibility in reducing pollution. However, little information has been synthesized regarding the amount and fate of nutrients produced by different animal operations. Nutrients produced by animals, if not effectively utilized by vegetation, can enter our surface water systems by atmospheric deposition, groundwater or direct runoff to surface waters. Depending on the surface water system, excessive nutrients can lead to drinking water or aquatic life impairments.

In 1992, the Environmental Management Commission adopted a rule modification (15A NCAC 2H.0217), establishing procedures for managing and reusing animal wastes from intensive livestock operations (updated 2T.1300 Section effective September 1, 2006). The rule applies to new, expanding or existing feedlots with animal waste management systems designed to serve animal populations of at least the following sizes: 100 head of cattle, 75 horses, 250 swine, 1,000 sheep or 30,000 birds (chickens and turkeys) with a liquid waste system. Currently, DEQ has regulatory authority over waste management of swine and cattle feedlots that use dry or liquid manure systems and poultry feedlots using liquid waste management systems. These permitted facilities are inspected on an annual basis by DWR or the NC Department of Agriculture and Consumer Services' (NCDA&CS) Division of Soil and Water Conservation. Most poultry operations, however, produce a dry litter waste that typically falls under the deemed permitted category (NCAC 2T.1303). Poultry operations in this category are only inspected as result of complaints.

The location of swine and cattle animal feeding operations (AFOs) are known because a state or NPDES permit is required. However, the locations of dry litter poultry operations and the disposal of their waste are not known to environmental regulators, making it difficult to form a complete picture of possible non-point source contributions within a specific watershed. Knowing what nutrient sources exist in the watershed can help water quality managers better understand available water quality data and to formulate appropriate decisions and regulatory recommendations.

Objective

In 2015, DWR Groundwater Planning staff issued a report entitled "A Summary of Land Applied Nutrients from Livestock Waste in North Carolina" which estimated the amount of nutrients applied to land from DWR permitted swine and wet poultry operations (NCDWR, 2015). The report focused on liquid waste from anaerobic lagoons to determine the spatial distribution of phosphorus and nitrogen applied to fields. It also compared those values to other known quantities of land applied nutrients (e.g., wastewater treatment residuals, synthetic fertilizer applications, residential subsurface on-site septic systems). The report estimated that over 30.8 million pounds (lb) of total nitrogen (TN) and over 11.9 million lb of phosphorus (P₂O₅) are applied annually through DWR permitted animal operations utilizing an anaerobic lagoon and spray field system. It was determined during the study that less than 4% of the poultry population and less than 12% of cattle operations in the state utilize an anaerobic lagoon and

spray field system; prompting an interest in the development of data on the management of waste nutrients from the vast majority of poultry and cattle in the state.

The objective of this project was to estimate the amount of nutrients generated by animal operations that were not accounted for in the DWR 2015 report and to evaluate the spatial distribution of dry poultry litter operations. The spatial distribution of animal operation types and relative magnitude of plant available nitrogen (PAN) and P₂O₅ produced by dry litter poultry operations versus permitted swine and cattle operations were compared. This report focuses on the poultry population in the state and percent changes in PAN and P₂O₅ produced in each river basin between 1992, 2000, 2006 and 2014.

Data Sources and Methodology

Poultry animal population numbers were retrieved from the US Department Agriculture’s (USDA) National Agriculture Statistics Service Quick Stats query: <http://quickstats.nass.usda.gov/>. Title 7 of the US Code of Federal Regulations prevents disclosure of information about specific operations of an individual farm and, therefore, information that can be identified to a specific farm in a county is withheld from compilation in the national agricultural statistics data. Counties with information withheld include those with operations that produce greater than 60% of the total production for that county or those counties which have three or less operations. The USDA collectively summarizes the county withheld data into the “Other Counties” category. For example, a known layer facility in Hyde County is permitted to house 4.75 million chickens; however, no data are available in the Agriculture Statistics data for that county, but the data are captured in the “Other Counties” category.

Table 1 lists the query parameter used to extract data from the Quick Stats database.

Table 1. Quick Stats Query Parameters

| Query Parameters | Chicken Broilers | Chicken Layers | Turkeys |
|-------------------|---|--|--------------------------------------|
| Program: | Survey | Survey | Survey |
| Sector: | Animals & Products | Animals & Products | Animals & Products |
| Group: | Poultry | Poultry | Poultry |
| Commodity: | Chickens | Chickens | Turkeys |
| Category: | Production | Inventory | Production |
| Data Item: | Chickens, Broilers-Production, Measured in Head | <ul style="list-style-type: none"> •1994, 2000 & 2006: Chickens (Excl Broilers)-Inventory •2014: Chicken, Layers- Inventory + Chickens, Pullets, Replacement-Inventory | Turkeys-Production, Measured in Head |
| Domain: | Total | Total | Total |
| Geographic Level: | County | County | County |
| Year: | 2006, 2014 | 1994, 2000, 2006, 2014 | 2006, 2014 |

The same parameters were used to query “all chickens excluding commercial broilers” from Quick Stats to estimate chicken layer numbers for 1992, 2000, and 2006. However, this query includes pullet and rooster numbers that were not included in 2014 data. The 2014 data did not include estimates for rooster inventory. Data for broilers and turkeys for 1992 and 2000 were only published in the North Carolina Statistical Bulletin.

Swine and cattle (beef and dairy) numbers were pulled from DWR’s BIMS database, querying permitted animal operations to include permits issued through 2015 and their allowable animal count. An existing 2006 BIMS query was used to generate swine and cattle 2006 manure numbers.

Manure production for animal types (poultry, cattle and swine) was derived from N.C. State University’s Nutrient Management guidance found on their website: <http://nutrients.soil.ncsu.edu/>. This was the same method used in DWR’s 2015 report except for the addition of a plant availability coefficient. The following formula was used to calculate total plant available nutrients:

$$\text{Total Plant Available Nutrients} = (\# \text{ of Animals/ Year}) \times (\text{Waste Weight or Volume/Animal}) \times (\text{Total Nutrients/Waste Weight or Volume}) \times \text{Availability Coefficient}$$

Examples of the calculations and assumptions made for each of the different type of livestock are available in Appendix A.

The different types of animals were grouped by poultry (adult broilers, layers and turkeys), cattle (dairy calves, heifers and cows, and beef stockers, feeders and broods) and swine (farrow to feeder, farrow to finish, farrow to wean, feeder to finish, wean to feeder, and wean to finish). The nutrients were then summed for each of these groups by county. Each county was then assigned a river basin; no county was assigned to more than one river basin even though counties may be in multiple basins (Table 2). Figure 1 shows river basins and the counties that were used to summarize total manure production for the basin. Poultry numbers that were assigned to “Other Counties” by the Agriculture Census were not assigned to a river basin, but the amounts were used in the statewide totals. A geographic information system (ESRI ArcGIS) was used to show the spatial distribution of total animal numbers, PAN and P₂O₅ by river basin and by county.

Table 2. River Basins and Corresponding Counties

| River Basin | Counties |
|------------------|--|
| Tar Pamlico | Granville, Vance, Franklin, Warren, Nash, Halifax, Edgecombe, Pitt, Beaufort, Hyde |
| Neuse | Orange, Durham, Wake, Johnston, Wilson, Wayne, Greene, Lenoir, Craven, Jones, Pamlico |
| Cape Fear | Alamance, Bladen, Chatham, Cumberland, Duplin, Guilford, Harnett, Hoke, Lee, Moore, New Hanover, Pender, Randolph, Sampson |
| Yadkin-PeeDee | Wilkes, Surry, Yadkin, Forsyth, Davie, Davidson, Iredell, Rowan, Cabarrus, Stanly, Montgomery, Richmond, Anson, Union |
| Catawba | Alexander, Catawba, Caldwell, Gaston, Lincoln, Mecklenburg, Burke, McDowell, Avery |
| Roanoke | Stokes, Rockingham, Caswell, Person, Bertie, Martin |
| White Oak | Onslow, Carteret |
| Lumber | Robeson, Columbus, Brunswick, Scotland |
| New | Ashe, Alleghany |
| French Broad | Buncombe, Haywood, Henderson, Madison, Mitchell, Transylvania, Yancey |
| Broad | Cleveland, Polk, Rutherford |
| Chowan | Chowan, Hertford, Northampton, Gates |
| Pasquotank | Currituck, Camden, Pasquotank, Perquimans, Washington, Tyrrell, Dare |
| Little Tennessee | Graham, Swain, Jackson, Macon |
| Hiwassee | Cherokee, Clay |
| Watauga | Watauga |

Note: Not all NC river basins and counties have animal operations or have information that can be disclosed.

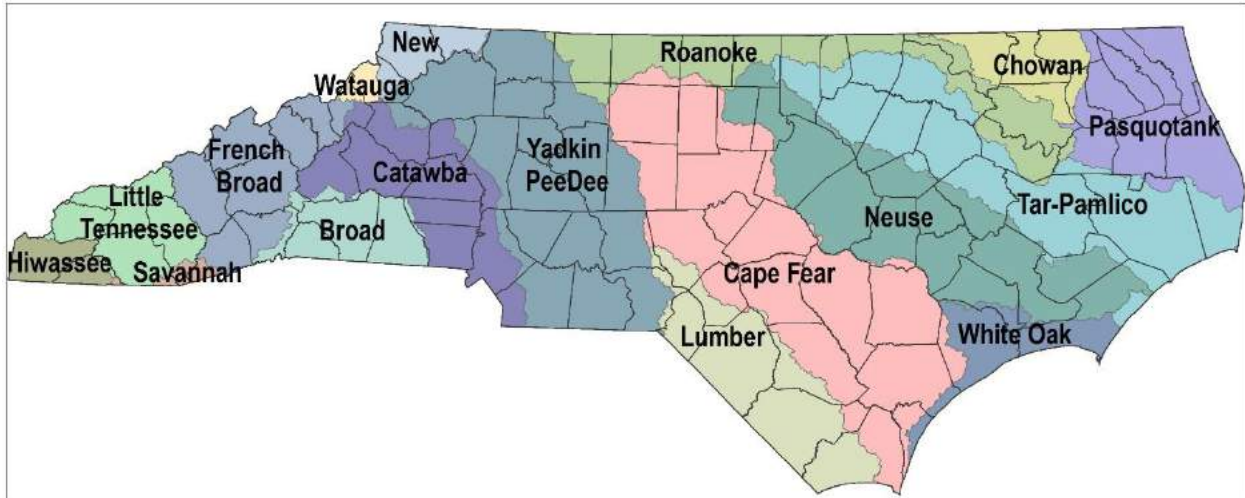


Figure 1: North Carolina Counties and River Basins

Results Summary

In terms of stock numbers, the greatest number of birds were found in Duplin, Union, Sampson and Wilkes counties leading to the Yadkin-Pee Dee and the Cape Fear river basins producing the most poultry nutrients. Swine in Duplin and Sampson counties in the Cape Fear River Basin produced the most swine nutrients statewide. Cattle in Iredell and Randolph in the Yadkin- PeeDee and Cape Fear river basins accounted for the majority of cattle-produced nutrients statewide. In terms of changes in stock over time, estimates of statewide shifts between 2006 and 2014/15 indicated an overall 7% decrease in PAN and a 6% decrease in P₂O₅ produced by poultry, swine and cattle. Comparing nutrient production across animal types, poultry operations produced the greatest amounts of PAN and P₂O₅ with 56.6 million PAN lb and 79.8 million P₂O₅ lb, produced in 2014. Additional maps and summaries by animal type are found in Appendix B, C and D.

Statewide Poultry Population and Densities

The highest numbers of poultry since the 1990’s have been in the Yadkin-Pee Dee and Cape Fear basins. The Yadkin-Pee Dee Basin had the highest poultry population with bird inventories over 15 million in Union County and over 11 million in Wilkes County in 2014 (Figure 2). The Cape Fear Basin had the second highest poultry population in 2014 with Duplin and Sampson counties having over 15 and 11 million birds, respectively. Evaluating poultry numbers by basin acreage indicates the Yadkin-Pee Dee and Cape Fear basins also have the highest bird densities (Table 3). At the county level, Alexander, and Union and Duplin counties have the highest bird densities (Table 10 Appx. B).

Table 3: Basin Poultry Density

| River Basin | 2014 Density (Poultry per Basin Acreage) |
|----------------|---|
| Yadkin-Pee Dee | 13.2 |
| Cape Fear | 9.9 |
| Chowan | 7.2 |
| Catawba | 6.8 |
| Lumber | 6.0 |
| Broad | 5.7 |
| Roanoke | 3.3 |
| Neuse | 2.5 |
| White Oak | 1.9 |
| Tar-Pamlico | 1.7 |
| Pasquotank | 1.0 |

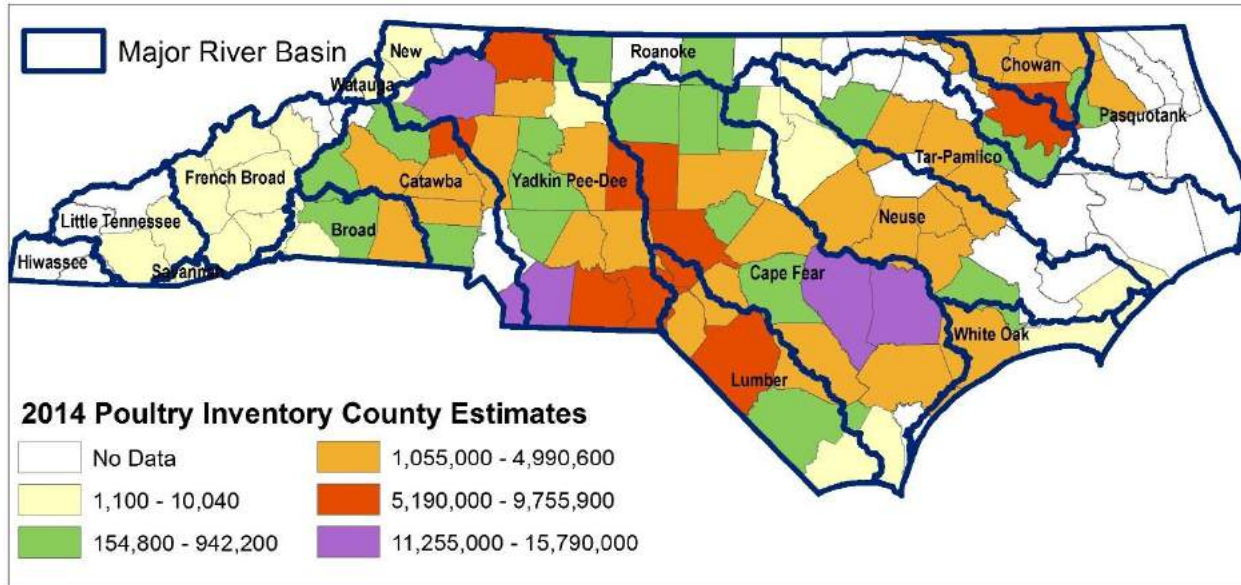


Figure 2: 2014 Poultry Inventory 2014 with River Basins

Poultry Changes by River Basin between 1992, 2000, 2006 and 2014

When evaluating growth of bird numbers by basin, the Broad, Lumber, Catawba and White Oak all had large increases in bird inventories between 2006 and 2014 (Table 4). The Lumber and Broad river basins each increased in poultry inventory since 1992 by over 300%; the Lumber poultry inventory increased by over 10 million birds since 1992. When comparing poultry inventory between 1992 and 2014, the Yadkin-Pee Dee Basin saw a 16% increase and the Cape Fear saw a 9% increase in birds. However, the type of poultry and manure management determines the amount of nutrients (PAN and P₂O₅) produced. Even with an increase in poultry numbers, the Yadkin-Pee Dee Basin had no change in PAN and a 5% decrease in P₂O₅, due to the increase in the number of broilers and layers and a decrease in turkeys from 1992 to 2014 (Table 5). The only basins with both a loss in poultry numbers and nutrients between 1992 and 2014 were the Neuse, Tar-Pamlico and Pasquotank basins.

Table 4: Basin Poultry Change in Inventory

| River Basin | Poultry Inventory | | | | Percent Inventory Change (Δ %) | | |
|---------------|-------------------|------------|------------|-------------------|--------------------------------|-----------|-----------|
| | 1992 | 2000 | 2006 | 2014 ¹ | 1992-2014 | 2000-2014 | 2006-2014 |
| Yadkin-PeeDee | 52,364,000 | 64,744,000 | 73,372,000 | 60,793,600 | 16 | -6 | -17 |
| Cape Fear | 52,975,000 | 54,445,000 | 56,208,000 | 57,906,600 | 9 | 6 | 3 |
| Catawba | 7,458,000 | 8,028,000 | 8,040,000 | 14,283,800 | 92 | 78 | 78 |
| Lumber | 2,604,000 | 4,540,000 | 6,628,000 | 12,829,700 | 393 | 183 | 94 |
| Neuse | 10,146,400 | 11,485,000 | 11,974,700 | 9,631,500 | -5 | -16 | -20 |
| Roanoke | 5,180,000 | 5,000,000 | 6,225,000 | 7,465,000 | 44 | 49 | 20 |
| Tar-Pamlico | 9,375,400 | 8,240,000 | 7,536,000 | 6,601,301 | -30 | -20 | -12 |
| Chowan | 4,540,000 | 5,460,000 | 5,680,000 | 6,020,000 | 33 | 10 | 6 |
| Broad | 1,270,000 | 1,850,000 | 2,340,000 | 5,475,400 | 331 | 196 | 134 |
| Pasquotank | 2,380,000 | 2,280,000 | 1,680,000 | 2,100,000 | -12 | -8 | 25 |
| White Oak | 1,122,000 | 1,060,000 | 1,064,000 | 1,681,300 | 50 | 59 | 58 |
| Other | 2,677,000 | 1,607,000 | 2,633,300 | 6,587,600 | 146 | 310 | 150 |

¹ 2014 data does not include rooster inventory.

Table 5: Basin Poultry Change in Nutrients Produced

| River Basin | Percent PAN Change (Δ lb) | | | Percent P ₂ O ₅ Change (Δ lb) | | |
|---------------|-----------------------------------|-------------|------------|---|-------------|------------|
| | 1992 -2014 | 2000 - 2014 | 2006 -2014 | 1992 -2014 | 2000 - 2014 | 2006 -2014 |
| Yadkin-PeeDee | 0 | -4 | -15 | -5 | -3 | -14 |
| Cape Fear | -2 | -4 | -5 | -6 | -7 | -8 |
| Catawba | 91 | 71 | 66 | 91 | 68 | 62 |
| Lumber | 273 | 153 | 84 | 237 | 142 | 80 |
| Neuse | -20 | -17 | -14 | -22 | -17 | -12 |
| Roanoke | 63 | 69 | 20 | 73 | 80 | 20 |
| Tar-Pamlico | -55 | -37 | -31 | -61 | -42 | -37 |
| Chowan | 33 | 10 | 6 | 33 | 10 | 6 |
| Broad | 168 | 166 | 118 | 128 | 151 | 110 |
| Pasquotank | -12 | -8 | 25 | -12 | -8 | 25 |
| White Oak | -5 | -2 | 9 | -12 | -10 | 2 |
| Other | 139 | 298 | 172 | 138 | 296 | 179 |

Comparison of Poultry and Swine and/or Cattle Nutrient Production by Basin

In 2014, poultry operations produced three times more pounds of PAN and six times more pounds of P₂O₅ than swine operations and eight times more pounds of PAN and nine times more pounds of P₂O₅ than cattle operations. In river basins with known nutrient sensitivity, poultry operations produced more PAN and P₂O₅ than swine (Table 6).

Table 6: Nutrient Production Comparison

| Basin | Poultry produced: X times as much PAN than Swine | Poultry PAN | Swine PAN | Poultry produced: X times as much P ₂ O ₅ than Swine | Poultry P ₂ O ₅ | Swine P ₂ O ₅ |
|----------------|--|----------------|---------------|---|--|---|
| Cape Fear | 2x | 16,873,187 | 9,574,482 | 3x | 23,488,961 | 6,719,394 |
| Tar-Pamlico | 1.5x | 1,795,074 | 1,166,176 | 3x | 2,459,403 | 816,405 |
| Neuse | 1 x | 3,520,717 | 3,309,586 | 2x | 5,215,734 | 2,323,652 |
| White Oak | 2x | 645,925 | 345,432 | 4x | 963,207 | 243,471 |
| Chowan | 4x | 1,377,906 | 349,883 | 4x | 1,733,760 | 243,358 |
| | X times as much PAN than Cattle | Poultry PAN | Cattle PAN | X times as much P ₂ O ₅ than Cattle | Poultry P ₂ O ₅ | Cattle P ₂ O ₅ |
| Yadkin-Pee Dee | 6x | 17,499,432 | 3,106,075 | 6x | 24,464,078 | 3,883,584 |

Total Manure Production Changes by Basin, 2006 vs. 2014

Combining poultry, swine and cattle manure production for each river basin, the Broad, Lumber and Catawba river basins had the highest increase in both PAN and P₂O₅ production from 2006 to 2014/15, which can be attributed to growing poultry populations in each of the basins. In the river basins with known nutrient sensitivity, the Cape Fear, Yadkin-Pee Dee, Neuse, Tar-Pamlico and Chowan have seen decreases in animal nutrient production. Collectively animals in the Cape Fear produced the most nutrients, at an estimated 28,174,530 lb PAN and 32,371,778 lb P₂O₅ in 2014 (Table 7).

Table 7: Total Animal Manure Change in Nutrients Produced between 2006 - 2014.

| River Basin | PAN (lb) 2006 | PAN (lb) 2014 | PAN Percent Change 2006 - 2014/15 (Δ%) | P ₂ O ₅ (lb) 2006 | P ₂ O ₅ (lb). 2014 | P ₂ O ₅ Percent Change 2006 - 2014/15 (Δ%) |
|-----------------------|---------------|---------------|--|---|--|--|
| Broad | 807,222 | 1,372,957 | 70 | 1,050,113 | 1,757,966 | 67 |
| Catawba | 4,206,106 | 5,013,378 | 19 | 5,767,631 | 6,990,469 | 21 |
| Chowan | 1,927,105 | 1,728,647 | -10 | 2,083,450 | 1,978,213 | -5 |
| Cape Fear | 30,181,069 | 28,174,530 | -7 | 35,286,880 | 32,371,778 | -8 |
| French Broad | 940,107 | 355,754 | -62 | 1,173,453 | 450,428 | -62 |
| Lumber | 3,583,363 | 4,360,776 | 22 | 3,618,961 | 4,727,819 | 31 |
| Neuse | 8,443,449 | 6,967,105 | -17 | 9,306,720 | 7,710,389 | -17 |
| New | 417,407 | 193,781 | -54 | 521,329 | 243,288 | -53 |
| Pasquotank | 924,797 | 654,891 | -29 | 862,133 | 727,757 | -16 |
| Roanoke | 2,215,000 | 2,177,539 | -2 | 2,778,971 | 2,829,675 | 2 |
| Tar-Pamlico | 4,881,659 | 3,087,566 | -37 | 5,765,663 | 3,434,644 | -40 |
| White Oak | 970,860 | 991,357 | 2 | 1,217,610 | 1,206,678 | -1 |
| Yadkin-Pee Dee | 25,312,857 | 20,912,523 | -17 | 34,080,611 | 28,562,525 | -16 |

Specific County and Basin Results Maps and Tables

The maps and tables provided in Appendix B show the poultry numbers by county and river basin, and the estimated available nutrients produced based on agriculture statistics available for 1992, 2000, 2006 and 2014. Cattle and swine numbers provided in Appendices C and D, respectively, are based on permits on record with DWR for 2006 and 2015 and show estimated available nutrients produced by county and river basin.

Discussion

Figure 3 was produced in 2015 by the N.C. Department of Agriculture and Consumer Services in preparation for management of a potential avian influenza outbreak. The map shows approximate locations of individual poultry farms and also shows farms that are not reported in the agriculture census data. The densities of farms shown in the Yadkin-Pee Dee and Cape Fear river basins are consistent with the spatial distribution of the agriculture census derived poultry maps provided in Appendix B.

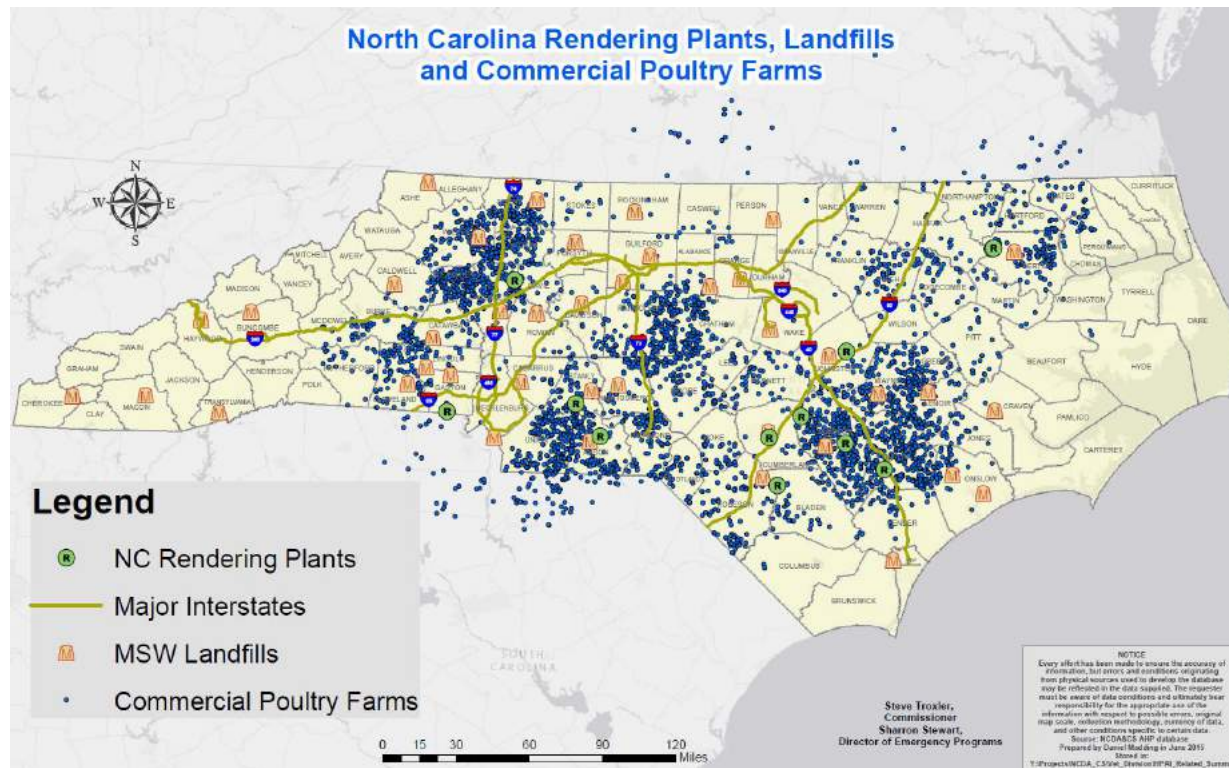


Figure 3: NCDA&CS Poultry Map

Identification of information from individual farm operators is protected by NC G.S. 106-24.1 and Title 7 of the US Code prevents disclosure of information regarding individual farm operations in development of the Agriculture Census; farm information is not disclosed when a county has three or less specific operations or those with operations that produce greater than 60% of the total production. Although this system provides security for individual farm operations it also limits the ability to accurately quantify animal numbers. The combination of the lack of permitting data and the agricultural statistics privacy laws adds significant uncertainty to assessment of the loading contribution of poultry to the state's nutrient-impaired waterbodies. Since dry litter poultry operations are deemed permitted and inspections are conducted only after reported complaints, the maps provided in Appendix B provide the best information DWR has in regards to poultry nutrient production.

Manure management by AFOs is under increasing scrutiny as the application of waste has raised both human and environmental health concerns, while also proving to be a valuable fertilizer source. As animal agriculture has shifted to large confined feeding facilities, manure management has increasingly resulted in manure that is stored in lagoons, stockpiled, or composted. Using manure at agronomic rates requires suitable and available land for its application. North Carolina ranked number one nationally for

tons of manure generated per farmland acre (EPA, 2013). Due to a swine farm moratorium put in place in 1997 and a new law passed in 2007 prohibiting the construction of new swine farms that use waste lagoons and spray fields as the primary method of waste management (SB 1465), nutrient contributions from swine operations have remained fairly constant over the last several years. However, the shifts in both location and the type of poultry industry in NC is potentially adding to the current nutrient loading from nonpoint sources. This adds to the concerns over environmental impacts of manure application on a limited land base.

Cattle and swine manure sludge are generally applied to fields relatively close to its generation, while dry poultry litter is potentially transported much farther for use as fertilizer. In accordance with 15A NCAC 02T.1400, haulers that move and land apply over 100 tons of animal waste per year must submit an annual report to DWR. However, DWR generally does not have the capacity to review and investigate the management and distribution of dry poultry litter. This rule also does not address litter land applied by the poultry operation itself nor does it apply to haulers that transport the litter for other non-land applications, such as biogas energy generation. In 2012, the Environmental Defense Fund examined North Carolina's manure hauler data, compliance, and hauling locations from 2006-2011. The primary conclusions of this study were that only a small portion of poultry litter data was reported to DWR and much of that data was incomplete compared to the estimated amount of litter produced in NC. Based on limited data, the review suggested that poultry litter was most commonly hauled and applied within the same county where it was produced. The report also noted that very little information was provided to DWR for Sampson and Duplin counties which are leading poultry production counties. (EDF, 2012).

It is assumed that manure spread on land at agronomic rates is efficiently utilized by plants. The amount of nutrients not utilized is difficult to quantify given the application of unregulated animal waste and limited air and water ambient data collected. Animal waste not utilized by plants can be volatilized and lost to the atmosphere, stored in the soils, or transported to surface water or aquifers via surface runoff or groundwater. A U.S. Geological Survey study of nutrient source shares and loads estimates 45%, 25% and 16% percent of the nitrogen load to the Cape Fear Estuary, Pamlico Sound, and Albemarle Sound, respectively, calculated by SPARROW model estimates of 2002 data, is attributed to manure (Moorman et al., 2014).

The amount and availability of nutrients stored in the subsurface soils and movement of nutrients from the surface through the vadose zone to groundwater is not well documented in NC. A study of surface water samples in a AFO dominated land use watershed in the Cape Fear River Basin showed no difference between dry and rainy periods, indicating chronic pollution fed by groundwater instead of acute stormwater runoff events (Mallin et al., 2015). Another study found a 35-year nitrogen retention time in heavily agricultural watersheds in the Midwest (Van Meter et al., 2016). The lag time was attributed to lost nitrogen as either nitrate in the vadose zone, organic nitrogen in the soils or lost to groundwater aquifers (Van Meter et al., 2016). This delay in nitrogen being utilized or transferred to surface waters complicates land use management as the results of implementation of nitrogen reducing activities may not be realized for years.

Nutrient data collected from DWR ambient stations in the coastal plain have shown an increase in organic nitrogen while ammonia nitrogen and nitrate-nitrite have declined. These trends are described in the 2015 Tar-Pamlico and 2009 Neuse River Basin Plans: <http://deq.nc.gov/about/divisions/water-resources/planning/basin-planning>. A recent study in the Neuse River Basin focused on identifying sources of dissolved organic nitrogen (DON); poultry waste was detected as a dominant source, while swine sources were not detected as contributors to the DON (Osburn et al., 2016). The study indicated

street runoff and poultry waste were the main anthropogenic sources with higher flows leading to increased loads of these sources (Osburn et al., 2016). Detection of the poultry fraction of DON increased going downstream, which coincides with the increase in agricultural land use in the coastal plain (Osburn et al., 2016). The poultry-sourced DON at the Ft. Barnwell sample location was determined to be almost equivalent to the total point source load of organic nitrogen in the basin (Osburn et al., 2016).

Reduction in nitrogen load to our surface waters is challenging without accurately quantifying atmospheric contributions to a watershed, and eventually seeking appropriate management measures on all significant emission sources. Emissions from confined animal operations comprise the great majority of atmospheric ammonia emissions (Aneja et al., 1998). Currently, these outputs are not directly regulated. However, in 2007, the NC Legislature enacted a law (SB 1465) requiring animal waste systems that serve new and expanding swine farms to meet or exceed five performance standards. One of the standards requires such farms to “substantially eliminate atmospheric emission of ammonia.” This regulation does not require reductions from existing operations, nor does it apply to other types of AFOs, such as cattle and poultry operations. Thus ammonia emissions from existing AFOs remain the largest unregulated source of atmospheric nitrogen emissions. The U.S. Environmental Protection Agency estimates through 2030 that ammonia emissions from poultry operations will be the highest when compared to other animal operations (EPA, 2004). Figure 4 shows the highest deposition of ammonium within NC coinciding with the locations of concentrations of AFOs (National Atmospheric Deposition Program/National Trends Network, 2012).

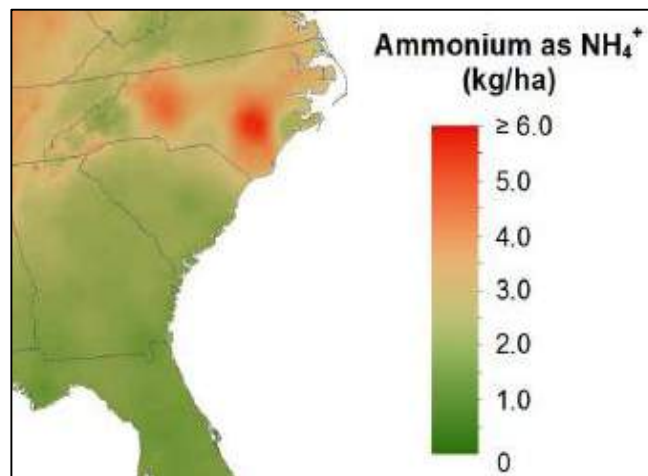


Figure 4: Ammonium Wet Deposition 2012
http://nadp.sws.uiuc.edu/maplib/ani/nh4_dep_ani.pdf

A 2016 air quality study indicated a change in the dominant source of nitrogen deposition with an overall decline in nitrate and nitrite (NO_x) emissions and an increase in ammonia emissions (Li et al., 2016). The study indicated that regulated reductions in fossil fuel combustion have reduced NO_x emissions, while increasing ammonia emissions from agriculture exceed the impacts of emissions from fossil fuel combustion on the nitrogen cycle (Li et al., 2016). The 2011 National Emission Inventory data for NC indicated agriculture contributes over 95% of all ammonia emissions (EPA NEI 2011). However, unlike NO_x emissions, agricultural ammonia emissions are not regulated and historically there are limited air quality sampling stations collecting ammonia data.

Knowing what the nutrient sources are and their application, storage and utilization rates are important for managing nutrients collectively on a basinwide scale. The spatial distribution of poultry, swine and cattle operations and estimates of their generated nutrients help provide guidance on where implementation efforts should be focused toward agricultural nutrient reduction.

Citations

Aneja, V., Murray, G. C., and J. Southerland. April 1998. Atmospheric Nitrogen Compounds: Emissions, Transport, Transformation, Deposition, and Assessment. EM, Air & Waste Management Association's Magazine for Environmental Managers, 22-25.

Crouse, D. A., T.J. Smyth, C.R. Crozier, S. Shah and B. R. Cleveland. 2014. "Livestock & Poultry Manure Production Rates and Nutrient Content", 2014 North Carolina Agricultural Chemicals Manual, North Carolina State University. <http://nutrients.soil.ncsu.edu/manures/Final-Tables-%28Ag-Chem-Manual-Version%29.pdf>

Environmental Defense Fund. 2012. Analysis of North Carolina Department of Environment and Natural Resources Poultry Manure Hauler Data. Memorandum from Damon Cory-Watson to Maggie Monast, Agriculture Policy Analyst. EDF. Aug 17, 2012.

Environmental Protection Agency 2004. National emission inventory: ammonia emissions from animal husbandry operations. U.S. EPA, Washington DC.

Environmental Protection Agency. 2013. Literature Review of Livestock and Poultry Manure. 820-R-13-002.

Environmental Protection Agency National Emissions Inventory Data 2011. <https://www.epa.gov/air-emissions-inventories/air-pollutant-emissions-trends-data>

Li, Y., Schichtel, B. A., Walker, J.T., Schwede, D.B., Chen, X., Lehmann, C. M. B., Puchalski, M. A., Gay, D. A., and J. L. Collett Jr. 2016. Increasing importance of deposition of reduced nitrogen in the United States. Proceedings of the National Academy of Sciences. 113 (21) 5874-5879, doi:10.1073/pnas.1525736113.

Mallin, M.A., McIver, M.R., and A.R. Robuck, 2015. Water Air Soil Pollution 226: 407. doi:10.1007/s11270-015-2669-y.

Moorman, M.C., Hoos, A.B., Bricker, S.B., Moore, R.B., García, A.M., and S.W. Ator. 2014. Nutrient load summaries for major lakes and estuaries of the Eastern United States, 2002: U.S. Geological Survey Data Series 820, 94 p. <http://dx.doi.org/10.3133/ds820>. ISSN 2327-638X.

National Atmospheric Deposition Program/National Trends Network. <http://nadp.sws.uiuc.edu/ntn/> North Carolina State University, Course, David. 2016 Nutrient Management in North Carolina. <http://nutrients.soil.ncsu.edu/>

North Carolina General Statute: § 143-215.8B Basinwide water quality management plans. http://www.ncleg.net/EnactedLegislation/Statutes/HTML/BySection/Chapter_143/GS_143-215.8B.html

North Carolina General Statute: § 106-24.1 Confidentiality of information collected and published. http://www.ncga.state.nc.us/enactedlegislation/statutes/pdf/bysection/chapter_106/gs_106-24.1.pdf

North Carolina Division of Water Resources. Groundwater Planning Branch. 2015. A Summary of Land Applied Nutrients from Livestock Waste in North Carolina.

http://www.ncwater.org/Reports_and_Publications/GWMS_Reports/Quality/A%20Summary%20of%20Land%20Applied%20Nutrients%20from%20Livestock%20Waste%20in%20North%20Carolina-Oct2015%20with%202016%20Revisions.pdf

Osburn, C. L., Handsel, L.T., Peierls, B.L., and H. W. Paerl. 2016. Predicting Sources of Dissolved Organic Nitrogen to an Estuary from an Agro-Urban Coastal Watershed. Environ. Sci. Technol., 2016, 50 (16), 8473–8484.

Title 7, U.S. Code, Section 2276 and the Confidential Information Protection and Statistical Efficiency Act prohibit public disclosure of individual information.

https://www.nass.usda.gov/About_NASS/Confidentiality_Pledge/NASS_Confidentiality_07.pdf

USDA’s National Agriculture Statistics Service Quick Stats query: <http://quickstats.nass.usda.gov/>

USDA’s National Agriculture Statistics Service, North Carolina Statistical Bulletin:

https://www.nass.usda.gov/Statistics_by_State/North_Carolina/Publications/Annual_Statistical_Bulletin/index.php

Van Meter, K. J., Basu, N. B., Veenstra, J. J., and C. L. Burras. 2016. The nitrogen legacy: emerging evidence of nitrogen accumulation in anthropogenic landscapes Environmental Research Letters, 11:3.

<http://iopscience.iop.org/article/10.1088/1748-9326/11/3/035014>

Appendix A:

The following are examples of the calculations for each of the different type of livestock so future updates are compared using the same method.

Broiler Assumptions:

Total county production (total produced/year)

Tons of litter produced = total production divided by 5 (5 cycles/year)

Accumulated whole house manure clean out per year = 7.2tons/1,000 bird capacity/year

Manure weights = 57.8 lb of N/ton, 40 lb of P₂O₅/ton

Production system waste application coefficient: N = 0.55, P = 1.0

Note: The nutrient coefficient for N was averaged to 0.55 because production system waste application management is unknown.

Example: PAN lb = SUM((animals#/5) * (7.2/1000) * 57.8 * 0.55)

P₂O₅ lb = SUM((animals#/5) * (7.2/1000) * 40 * 1.0)

SUM((5,950,000 animals/5 cycles/year) * (7.2tons/1000 birds) * (57.8lb/ton * 0.55) = 272,377 lb PAN

SUM((5,950,000 animals/5 cycles /year) * (7.2tons/1000 birds) * (40lb/ton * 1.0) = 342,720 lb TP (P₂O₅)

Chickens and Pullets Layer Assumptions:

Total Inventory used because bird house numbers are constant.

Accumulated manure=24tons/1,000 bird capacity/year

Manure weights = 47.6 lb of N/ton; 44.7 lb of P₂O₅/ton

Production system waste application coefficient: N = 0.55, P = 1.0

Note: The nutrient coefficient for N was averaged to 0.55 because production system waste application management was unknown.

Example: PAN lb = SUM((animals#/1) * (24/1000) * 47.6 * 0.55)

P₂O₅ lb = SUM((animals#/1) * (24/1000) * 44.7 * 1.0)

SUM(875,000*(24/1000)*47.6*0.55) = 549,780 lb PAN

SUM(875,000*(24/1000)*44.7*1.0) = 938,700 lb TP (P₂O₅)

Turkey Assumptions:

2.5 flocks per year

Accumulated manure =21 tons/1,000 bird capacity/year, 21= average of Hen (17) and Tom (25).

Manure weights= 54 lb of N/ton; 48.2 lb of P₂O₅/ton

Production system waste application coefficient: N = 0.55, P = 1.0

Note: The nutrient coefficient for N was averaged to 0.55 because production system waste application management was unknown.

Example: PAN lb = SUM((animals#/2.5) * (21/1000) * 54 * 0.55)

P₂O₅ lb = SUM((animals#/2.5) * (21/1000) * 48.2 * 1.0)

SUM((3,5000,000/2.5)*(21/1000)*54*0.55) = 873,180 lb PAN

SUM((3,5000,000/2.5)*(21/1000)*48.2*1.0) = 1,417,080 lb TP (P₂O₅)

Swine Assumptions:

Note: The nutrient coefficient for N was averaged to 0.55 (average of irrigated factor [0.5] and the incorporated factor [0.6]) because production system waste application management was unknown. Although, it is acknowledged that a majority of swine operations in NC apply their waste through spray irrigation.

Example: PAN lb = $SUM((\text{animals\#}) * \text{accumulated manure\#} * (\text{N manure weight\#/1000}) * 0.55)$
P₂O₅ lb = $SUM((\text{animals\#}) * \text{accumulated manure\#} * (\text{P manure weight\#/1000}) * 1.0)$

Farrow to Feeder

Accumulated manure = 3,861 gallons/animal/yr

Manure weights = 3.6 lb of N/1000 gallons; 1.4 lb of P₂O₅ /1000 gallons

Production system waste application coefficient: N = 0.55, P= 1.0

Example: $SUM(2000/1*3861*(3.6/1000)*.55)= 15,290$ PAN lb
 $SUM(2000/1*3861*(1.4/1000)* 1.0)=10,811$ lb TP (P₂O₅)

Farrow to Finish

Accumulated manure = 10,478 gallons/animal/yr

Manure weights = 3.6 lb of N/1000 gallons; 1.4 lb of P₂O₅ /1000 gallons

Production system waste application coefficient: N = 0.55, P = 1.0

Example: $SUM(200/1*10478*(3.6/1000)*.55)= 4,149$ PAN lb
 $SUM(200/1*10478*(1.4/1000)* 1.0)=2,934$ lb TP (P₂O₅)

Farrow to Wean

Accumulated manure = 3,203 gallons/animal/yr

Manure weights = 2.4 lb of N/1000 gallons; 0.9 lb of P₂O₅ /1000 gallons

Production system waste application coefficient: N = 0.55, P = 1.0

Example: $SUM(2200/1*3203*(2.4/1000)*.55) = 9,302$ PAN lb
 $SUM(2200/1*3203*(0.9/1000)* 1.0) =6,342$ lb TP (P₂O₅)

Feeder to Finish

Accumulated manure= 927 gallons/animal/yr

Manure weights = 3.6 lb of N/1000 gallons; 1.4 lb of P₂O₅/1000 gallons

Production system waste application coefficient: N = 0.55, P = 1.0

Example: $SUM(2400/1*927*(3.6/1000)*.55) = 4,405$ PAN lb
 $SUM(2400/1*927*(1.4/1000)* 1.0) = 3,115$ lb TP (P₂O₅)

Wean to Feeder

Accumulated manure = 191 gallons/animal/yr

Manure weights = 3.6 lb of N/1000 gallons; 1.4 lb of P₂O₅ /1000 gallons

Production system waste application coefficient: N= 0.55, P= 1.0

Example: $SUM(2600/1*191*(3.6/1000)*.55) = 983$ PAN lb
 $SUM(2600/1*191*(1.4/1000)* 1.0) = 695$ lb TP (P₂O₅)

Wean to Finish

Accumulated manure= 776 gallons/animal/yr

Manure weights = 3.6 lb of N/1000 gallons; 1.4 lb of P₂O₅ /1000 gallons

Production system waste application coefficient: N = 0.55, P = 1.0

Example: $SUM(2269/1*776*(3.6/1000)*.55) = 3,486$ PAN lb
 $SUM(2269/1*776*(1.4/1000)* 1.0) = 2,465$ lb TP (P₂O₅)

Cattle Assumptions

Example: PAN lb = $\text{SUM}(\text{animals\#}) * \text{accumulated manure\#} * (\text{N manure weight\#/1}) * 0.5$

$\text{P}_2\text{O}_5 \text{ lb} = \text{SUM}(\text{animals\#}) * \text{accumulated manure\#} * (\text{P manure weight\#/1}) * 1.0$

Dairy Calf

Accumulated manure= 4.1 tons/animal/yr

Manure weights = 11.2 lb of N/ton; 7.0 lb of P_2O_5 /ton

Production system waste application coefficient; N= 0.5, P= 1.0

Example: $\text{SUM}(300*4.1*(11.2/1)*.5) = 6,888 \text{ PAN lb}$

$\text{SUM}(300*4.1*(7/1)* 1.0) = 8,610 \text{ lb TP (P}_2\text{O}_5)$

Dairy Heifer

Accumulated manure = 12 tons/animal/yr

Manure weights = 11.2 lb of N/ton; 7.0 lb of P_2O_5 /ton

Production system waste application coefficient: N= 0.5, P= 1.0

Example: $\text{SUM}(1400*12*(11.2/1)*.5) = 94,080 \text{ PAN lb}$

$\text{SUM}(1400*12*(7/1)* 1.0) = 117,600 \text{ lb TP (P}_2\text{O}_5)$

Dairy Cow (including dry cows)

Accumulated manure= 17 tons/animal/yr

Manure weights= 11.2 lb of N per ton & 7.0 lb of P_2O_5 per ton

Production system waste application coefficient N= 0.5, P= 1.0

Example: $\text{SUM}(1750*17*(11.2/1)*.5) = 166,600 \text{ PAN lb}$

$\text{SUM}(1750*17*(7/1)* 1.0) = 208,250 \text{ lb TP (P}_2\text{O}_5)$

Beef Stocker

Accumulated manure= 1.5 tons/animal/yr

Manure weights= 13.0 lb of N per ton & 8.3 lb of P_2O_5 per ton

Production system waste application coefficient N= 0.5, P= 1.0

Example: $\text{SUM}(200*1.5*(13/1)*.5) = 1,950 \text{ PAN lb}$

$\text{SUM}(200*1.5*(8.3/1)* 1.0) = 2,490 \text{ lb TP (P}_2\text{O}_5)$

Beef Feeder

Accumulated manure= 2.2 tons/animal/yr

Manure weights= 13.0 lb of N per ton & 8.3 lb of P_2O_5 per ton

Production system waste application coefficient N= 0.5, P= 1.0

Example: $\text{SUM}(200*2.2*(13/1)*.5) = 2,860 \text{ PAN lb}$

$\text{SUM}(200*2.2*(8.3/1)* 1.0) = 3,652 \text{ lb TP (P}_2\text{O}_5)$

Beef Brood

Accumulated manure= 3 tons/animal/yr

Manure weights= 13.0 lb of N per ton & 8.3 lb of P_2O_5 per ton

Production system waste application coefficient N= 0.5, P= 1.0

Example: $\text{SUM}(500*3*(13/1)*.5) = 9,750 \text{ PAN lb}$

$\text{SUM}(500*3*(8.3/1)* 1.0) = 12,450 \text{ lb TP (P}_2\text{O}_5)$

Appendix B - Poultry

Poultry numbers based on agriculture statistics available for 1992, 2000, 2006 and 2014 and the estimated available nutrients produced by county and river basin are presented below. The county statistics show the Yadkin-Pee Dee and Cape Fear river basins as having the largest poultry populations. Even though Wilkes County maintains its status of having one the highest poultry populations in the state over the years, the poultry concentration has shifted from the upper portions of the Yadkin-Pee Dee to the lower portions of the basin. A similar shift has occurred in the Cape Fear Basin with the shift in poultry numbers from some of the upper counties to the lower basin. The shifts in poultry concentrations are likely linked to the locations of poultry processing plants and the supply demand of these facilities. Table 7 provides the summarized poultry inventory and percent change between comparison years for each of the river basins.

In 1992, Union and Wilkes counties each had a poultry inventory over 16 million, and Duplin, Chatham and Moore counties each had over 10 million birds; there were also 45 counties with either no birds or inventory information was not disclosed (Figure 5). Union and Wilkes counties each had over 17 million birds in 2000 and 19 million birds in 2006. Duplin and Randolph counties had over 10 million birds in 2000 and 2006, with 45 counties reporting no disclosed data in 2000 and 36 counties in 2006 (Figures 6 & 7). In 2014, the inventory population of birds dropped collectively in the top four producing counties although Duplin increased in bird inventory with over 15 million birds and Sampson county became the third top inventory county with over 11 million birds (Figure 8). Union and Wilkes counties dropped in inventory numbers from 2006 but still remain in the top four counties with over 15 million in Union and over 11 million in Wilkes; there were 25 counties with no data. Hyde County is one of the counties that reported no data because information would disclose information on the one poultry facility that is permitted for 4.75 million birds. Table 10 provides the estimated poultry inventory for each county and the 2014 county density of birds per acreage.

Table 7: Summarized Poultry data by Basin

| River Basin | 1992 Poultry Inventory | 2000 Poultry Inventory | 2006 Poultry Inventory | 2014 Poultry Inventory ¹ | % change 1992- 2014 inventory (Δ %) | % change 2000- 2014 inventory (Δ %) | % change 2006- 2014 inventory (Δ %) |
|--|------------------------------|------------------------------|------------------------------|---|---|---|---|
| Yadkin-PeeDee | 52,364,000 | 64,744,000 | 73,372,000 | 60,793,600 | 16 | -6 | -17 |
| Cape Fear | 52,975,000 | 54,445,000 | 56,208,000 | 57,906,600 | 9 | 6 | 3 |
| Catawba | 7,458,000 | 8,028,000 | 8,040,000 | 14,283,800 | 92 | 78 | 78 |
| Lumber | 2,604,000 | 4,540,000 | 6,628,000 | 12,829,700 | 393 | 183 | 94 |
| Neuse | 10,146,400 | 11,485,000 | 11,974,700 | 9,631,500 | -5 | -16 | -20 |
| Roanoke | 5,180,000 | 5,000,000 | 6,225,000 | 7,465,000 | 44 | 49 | 20 |
| Tar-Pamlico | 9,375,400 | 8,240,000 | 7,536,000 | 6,601,301 | -30 | -20 | -17 |
| Chowan | 4,540,000 | 5,460,000 | 5,680,000 | 6,020,000 | 33 | 10 | 6 |
| Broad | 1,270,000 | 1,850,000 | 2,340,000 | 5,475,400 | 331 | 196 | 134 |
| Pasquotank | 2,380,000 | 2,280,000 | 1,680,000 | 2,100,000 | -12 | -8 | 25 |
| White Oak | 1,122,000 | 1,060,000 | 1,064,000 | 1,681,300 | 50 | 59 | 58 |
| Other | 2,677,000 | 1,607,000 | 2,633,300 | 6,587,600 | 146 | 310 | 150 |
| ¹ 2014 data does not include rooster inventory. | | | | | | | |

Figure 5: 1992 Inventory of Poultry by County

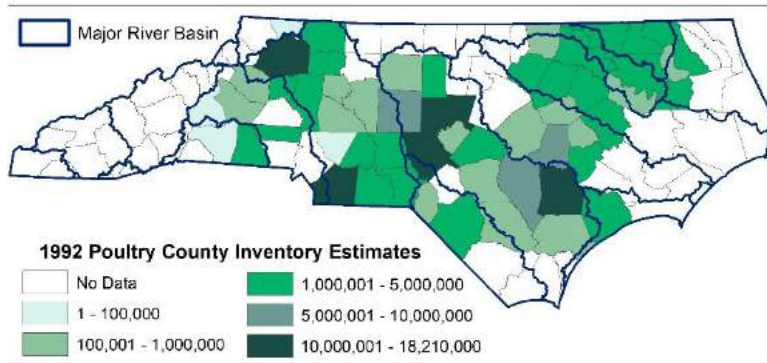


Figure 6: 2000 Inventory of Poultry by County

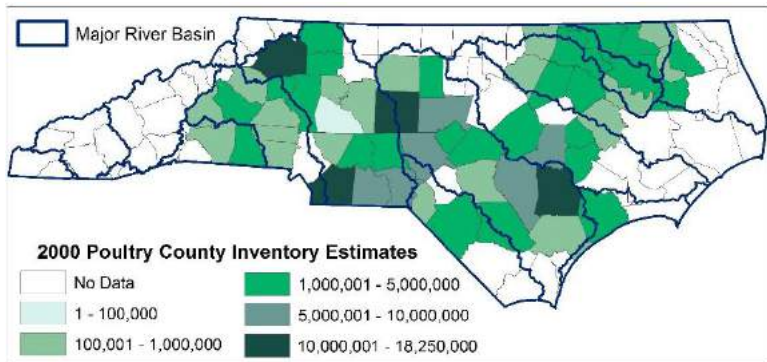


Figure 7: 2006 Inventory of Poultry by County

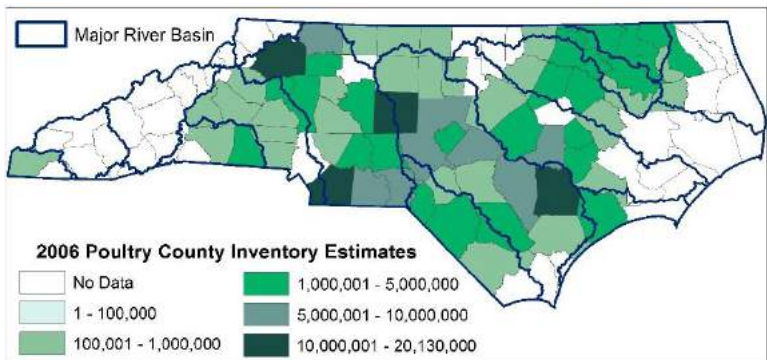
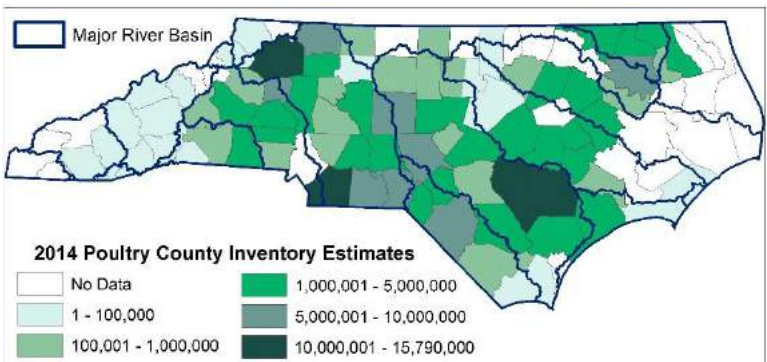


Figure 8: 2014 Inventory of Poultry by County



The amount of plant available nitrogen (PAN) produced by poultry depends on the type of poultry and the manure management scheme. The statewide patterns of PAN concentrations generally correspond with the populations of birds. Table 8 provides the estimated collective PAN by basin produced by poultry and Table 11 provides PAN estimates by county.

In 1992, Union County had the largest poultry inventory leading to a production of over 6.8 million pounds (lb) of PAN produced, while Duplin County had the fifth top poultry inventory and the second highest production of PAN at nearly 4.5 million lb (Figure 9). In 2000, the greatest production of PAN was in Union, Wilkes and Duplin counties with each over 4 million lb (Figure 10). Union, Wilkes and Duplin counties each had over 4.5 million lb of PAN produced by poultry in 2006, while Sampson County had the fifth highest poultry inventory and fourth highest PAN production rate at 3.4 million lb (Figure 11). In 2014, Union and Duplin counties produced over 4.5 million lb of PAN. The distribution of estimated PAN by river basin shows that the Yadkin-Pee Dee and Cape Fear basins overwhelming have the most nitrogen production statewide.

Table 8: Summarized Pounds of Poultry Plant Available Nitrogen (PAN) data by Basin

| River Basin | 1992 | 2000 | 2006 | 2014 | % change | % change | % change |
|----------------------|-------------|-------------|-------------|-------------|-----------------------------------|-----------------------------------|-----------------------------------|
| | PAN (lb) | PAN (lb) | PAN (lb) | PAN (lb) | 1992 - 2014 PAN (lb, Δ%) | 2000 - 2014 PAN (lb, Δ%) | 2006 - 2014 PAN (lb, Δ%) |
| Yadkin-PeeDee | 17,583,211 | 18,240,459 | 20,576,381 | 17,499,432 | 0 | -4 | -15 |
| Cape Fear | 17,263,620 | 17,569,403 | 17,854,802 | 16,873,187 | -2 | -4 | -5 |
| Catawba | 2,225,510 | 2,487,789 | 2,559,237 | 4,247,919 | 91 | 71 | 66 |
| Lumber | 795,010 | 1,173,388 | 1,614,983 | 2,968,058 | 273 | 153 | 84 |
| Neuse | 4,380,248 | 4,236,392 | 4,083,122 | 3,520,717 | -20 | -17 | -14 |
| Roanoke | 1,185,640 | 1,144,440 | 1,610,563 | 1,930,333 | 63 | 69 | 20 |
| Tar-Pamlico | 4,007,269 | 2,828,695 | 2,594,063 | 1,795,074 | -55 | -37 | -31 |
| Chowan | 1,039,151 | 1,249,728 | 1,300,084 | 1,377,906 | 33 | 10 | 6 |
| Broad | 487,998 | 491,346 | 599,506 | 1,306,726 | 168 | 166 | 118 |
| Pasquotank | 544,754 | 521,865 | 384,532 | 480,665 | -12 | -8 | 25 |
| White Oak | 680,050 | 661,122 | 592,551 | 645,925 | -5 | -2 | 9 |
| Other | 1,682,014 | 1,009,711 | 1,476,014 | 4,022,007 | 139 | 298 | 172 |

Figure 9: 1992 Estimated Total Pounds of PAN per County Produced by Poultry

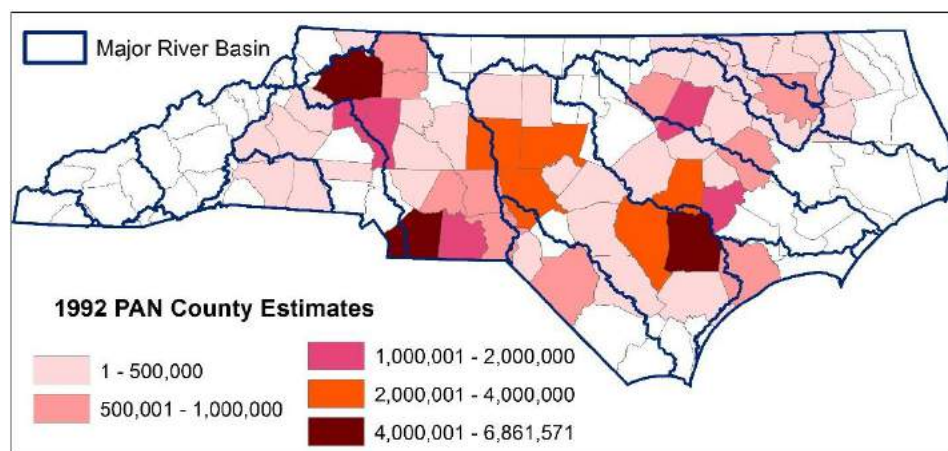


Figure 10: 2000 Estimated Total Pounds of PAN per County Produced by Poultry

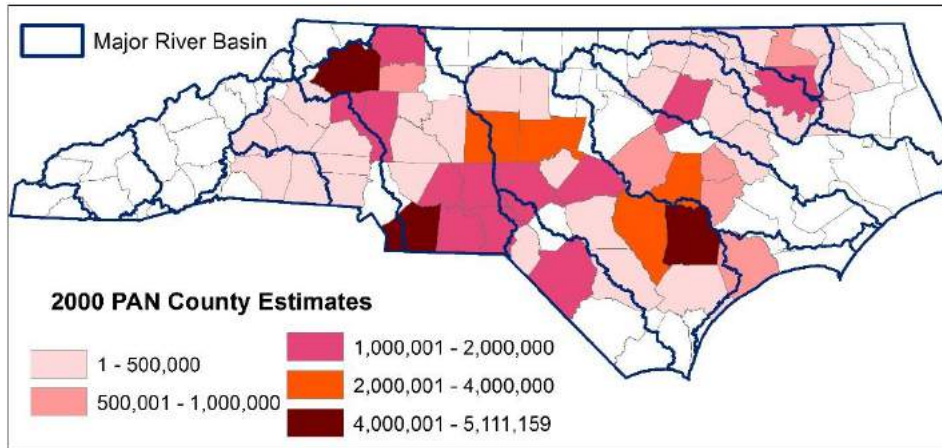


Figure 11: 2006 Estimated Total Pounds of PAN per County Produced by Poultry

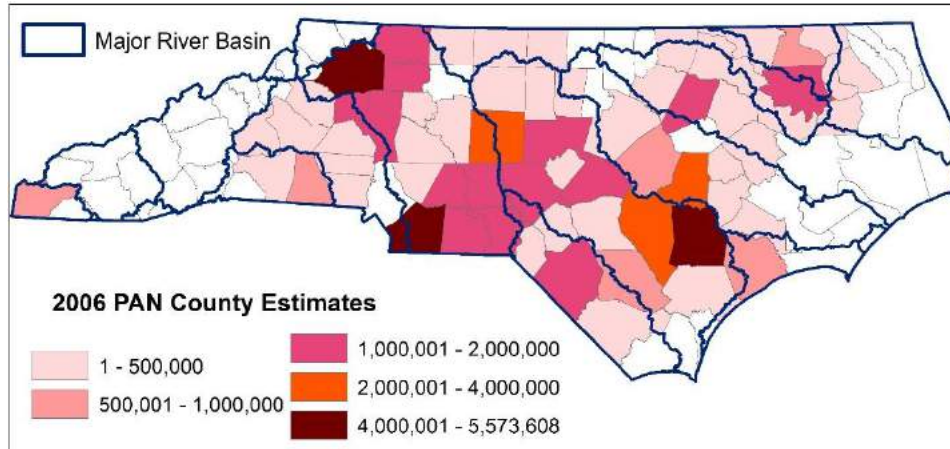
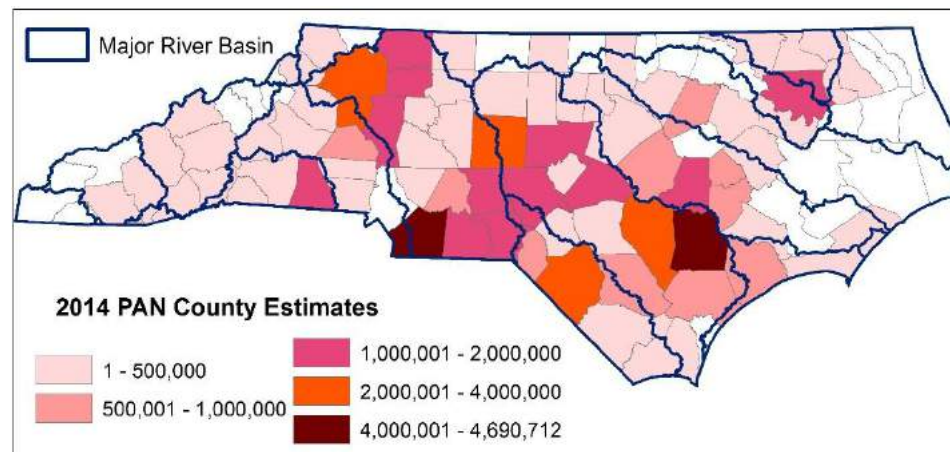


Figure 12: 2014 Estimated Total Pounds of PAN per County Produced by Poultry



The amount of phosphorus (P₂O₅) produced by poultry depends on the type of poultry and the manure management scheme. The statewide patterns of P₂O₅ concentrations generally correspond with the populations of birds. Table 9 provides the estimated collective basin P₂O₅ produced by poultry and Table 12 provides P₂O₅ estimates by county.

In 1992, Union County had the highest poultry inventory and nearly twice (~10 million lb) the amount of P₂O₅ produced in this inventory as the next highest inventory county of Wilkes with 5.9 million lb (Figure 13). In 2000 and 2006, Union, Duplin and Wilkes counties all produced over 6 million lb of P₂O₅ (Figure 14 & 15). In 2014, Union and Duplin counties produced over 6 million lb of P₂O₅, while Wilkes County fell to the fifth highest producer of P₂O₅ by poultry operations (Figure 16). The Yadkin-Pee Dee and Cape Fear basins, respectively, are the top two producers of P₂O₅.

Table 9: Summarized Poultry Phosphorus (P₂O₅) data by Basin

| River Basin | 1992 P ₂ O ₅ (lb) | 2000 P ₂ O ₅ (lb) | 2006 P ₂ O ₅ (lb) | 2014 P ₂ O ₅ (lb) | % change 1992 - 2014 P ₂ O ₅ (lb, Δ%) | % change 2000 - 2014 P ₂ O ₅ (lb, Δ%) | % change 2006 - 2014 P ₂ O ₅ (lb, Δ%) |
|---------------|---|---|---|---|---|---|---|
| Yadkin-PeeDee | 25,679,153 | 25,286,036 | 28,462,409 | 24,464,078 | -5 | -3 | -14 |
| Cape Fear | 24,857,820 | 25,279,632 | 25,560,836 | 23,488,961 | -6 | -7 | -8 |
| Catawba | 3,166,574 | 3,589,718 | 3,728,160 | 6,036,338 | 91 | 68 | 62 |
| Lumber | 1,114,949 | 1,553,748 | 2,088,466 | 3,753,018 | 237 | 142 | 80 |
| Neuse | 6,722,938 | 6,287,004 | 5,933,256 | 5,215,734 | -22 | -17 | -12 |
| Roanoke | 1,491,840 | 1,440,000 | 2,157,732 | 2,585,484 | 73 | 80 | 20 |
| Tar-Pamlico | 6,357,283 | 4,225,248 | 3,878,093 | 2,459,403 | -61 | -42 | -37 |
| Chowan | 1,307,520 | 1,572,480 | 1,635,840 | 1,733,760 | 33 | 10 | 6 |
| Broad | 735,502 | 666,216 | 799,488 | 1,675,177 | 128 | 151 | 110 |
| Pasquotank | 685,440 | 656,640 | 483,840 | 604,800 | -12 | -8 | 25 |
| White Oak | 1,099,478 | 1,072,932 | 946,625 | 963,207 | -12 | -10 | 2 |
| Other | 2,871,886 | 1,723,989 | 2,443,090 | 6,824,606 | 138 | 296 | 179 |

Figure 13: 1992 Estimated Total lb P₂O₅ per County Produced by Poultry

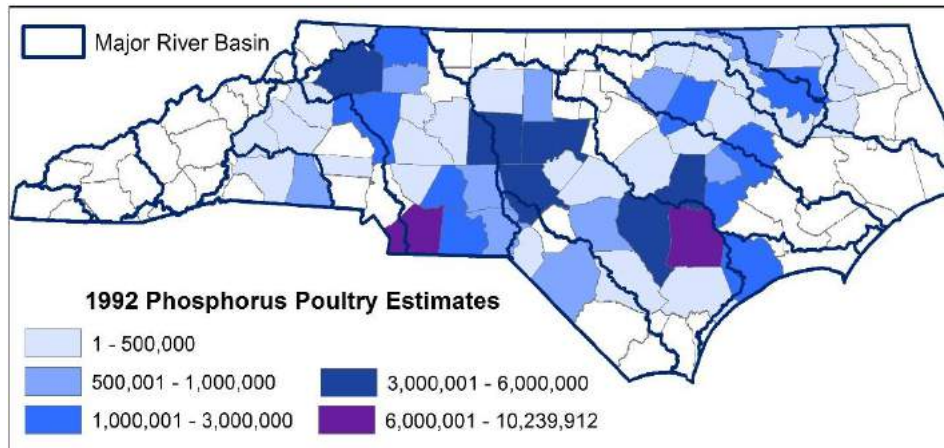


Figure 14: 2000 Estimated Total lb P₂O₅ per County Produced by Poultry

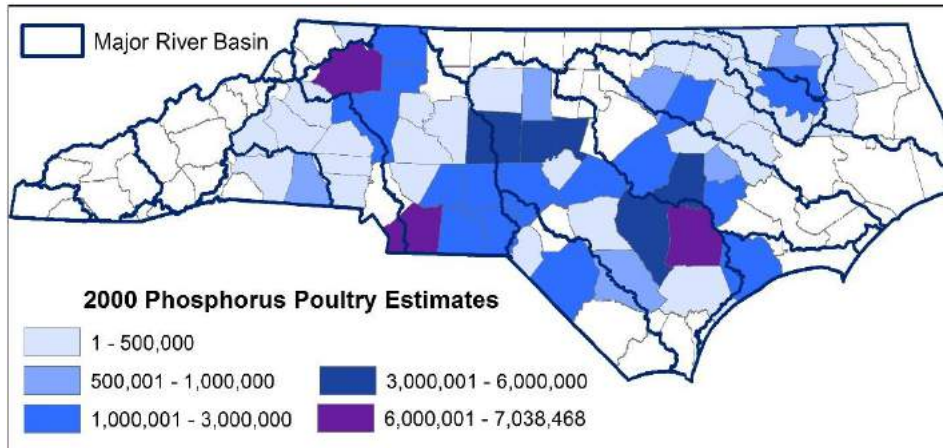


Figure 15: 2006 Estimated Total lb P₂O₅ per County Produced by Poultry

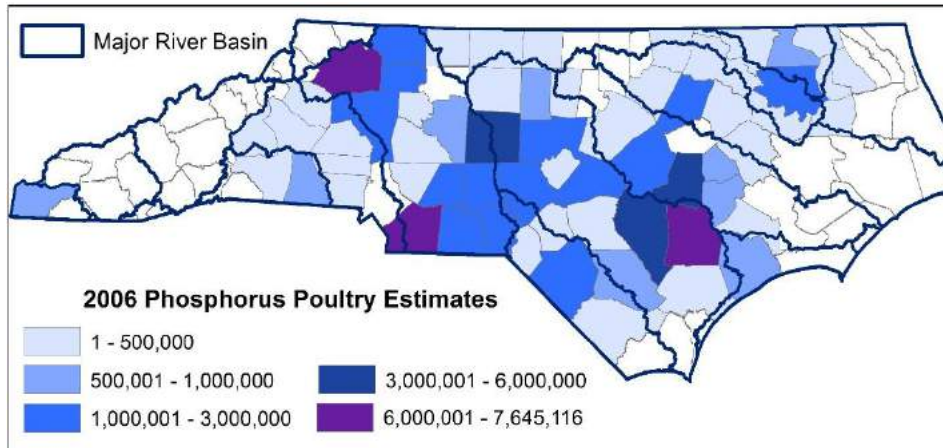


Figure 16: 2014 Estimated Total lb P₂O₅ per County Produced by Poultry

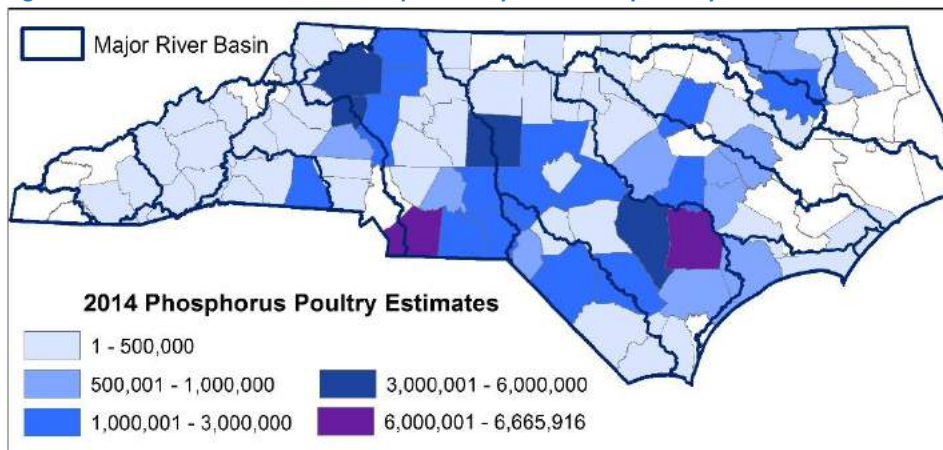


Table 10: County Poultry Inventory Estimates

| County | Inventory 1992 | Inventory 2000 | Inventory 2006 | Inventory 2014 | Density (Poultry per Basin Acreage) 2014 |
|------------|-------------------|-------------------|-------------------|-------------------|--|
| ALAMANCE | 1,325,000 | 1,125,000 | 940,000 | 284,000 | 1.0 |
| ALEXANDER | 4,880,000 | 3,955,000 | 4,740,000 | 8,305,000 | 49.2 |
| ALLEGHANY | 40,000 | | | | |
| ANSON | 2,700,000 | 5,855,000 | 6,368,000 | 6,506,000 | 18.9 |
| ASHE | | | | 2,800 | 0.0 |
| AVERY | | | | | 0.0 |
| BEAUFORT | | | | | 0.0 |
| BERTIE | 4,360,000 | 4,440,000 | 4,940,000 | 6,400,000 | 13.5 |
| BLADEN | 370,000 | 1,060,000 | 2,330,000 | 2,900,000 | 5.1 |
| BRUNSWICK | | | | 1,400 | 0.0 |
| BUNCOMBE | | | | 10,040 | 0.0 |
| BURKE | 480,000 | 1,140,000 | 780,000 | 1,200,000 | 3.7 |
| CABARRUS | 60,000 | 120,000 | 835,000 | 610,000 | 2.6 |
| CALDWELL | 918,000 | 560,000 | 160,000 | 250,000 | 0.8 |
| CAMDEN | | | | | |
| CARTERET | | | | 1,300 | 0.0 |
| CASWELL | | | 220,000 | 270,000 | 1.0 |
| CATAWBA | | 800,000 | 900,000 | 2,277,000 | 8.6 |
| CHATHAM | 10,950,000 | 8,340,000 | 7,199,000 | 4,335,000 | 9.6 |
| CHEROKEE | | | 800,000 | | |
| CHOWAN | 400,000 | 560,000 | 600,000 | 510,000 | 3.4 |
| CLAY | | | | | |
| CLEVELAND | 1,198,000 | 1,490,000 | 2,040,000 | 4,532,000 | 15.1 |
| COLUMBUS | | | 860,000 | 592,400 | 1.0 |
| CRAVEN | | | | | |
| CUMBERLAND | 500,000 | 187,000 | 680,000 | 638,000 | 1.5 |
| CURRITUCK | | | | | |
| DARE | | | | | |
| DAVIDSON | 680,000 | 980,000 | 1,428,000 | 1,295,000 | 3.6 |
| DAVIE | 200,000 | 287,000 | 370,000 | 255,000 | 1.5 |
| DUPLIN | 10,394,000 | 10,670,000 | 11,248,000 | 15,790,000 | 30.1 |
| DURHAM | | | | 2,300 | 0.0 |
| EDGECOMBE | 1,200,000 | 1,092,000 | 1,365,000 | 1,330,000 | 4.1 |
| FORSYTH | | | | 2,600 | 0.0 |
| FRANKLIN | 1,220,000 | 995,000 | 450,000 | 340,000 | 1.1 |
| GASTON | | 280,000 | 400,000 | 448,500 | 1.9 |
| GATES | 1,080,000 | 980,000 | 1,160,000 | 1,570,000 | 7.1 |
| GRAHAM | | | | | 0.0 |
| GRANVILLE | | | | 1,300 | 0.0 |
| GREENE | 926,400 | 1,420,000 | 1,016,000 | 1,270,000 | 7.5 |
| GUILFORD | 110,000 | 173,000 | 247,000 | 335,000 | 0.8 |
| HALIFAX | 1,300,000 | 1,160,000 | 1,121,000 | | 0.0 |
| HARNETT | 1,340,000 | 4,800,000 | 5,560,000 | 4,902,600 | 12.7 |
| HAYWOOD | | | | 1,500 | 0.0 |
| HENDERSON | | | | 2,080 | 0.0 |
| HERTFORD | 1,160,000 | 2,260,000 | 2,200,000 | 2,100,000 | 9.1 |
| HOKE | | | 600,000 | 1,122,000 | 4.5 |
| HYDE | | | | | |
| IREDELL | 1,720,000 | 2,240,000 | 1,730,000 | 2,030,000 | 5.3 |
| JACKSON | | | | 1,800 | 0.0 |
| JOHNSTON | 380,000 | 2,700,000 | 2,864,000 | 1,960,000 | 3.8 |

| County | Inventory 1992 | Inventory 2000 | Inventory 2006 | Inventory 2014 | Density (Poultry per Basin Acreage) 2014 |
|----------------|-------------------|-------------------|-------------------|-------------------|--|
| JONES | | | 800,000 | 676,000 | 2.2 |
| LEE | 700,000 | 1,400,000 | 1,420,000 | 780,000 | 4.7 |
| LENOIR | 2,060,000 | 1,805,000 | 1,084,000 | 1,055,000 | 4.1 |
| LINCOLN | 1,140,000 | 780,000 | 740,000 | 1,533,300 | 7.8 |
| MACON | | | | 1,200 | 0.0 |
| MADISON | | | | 3,800 | 0.0 |
| MARTIN | 820,000 | 560,000 | 820,000 | 510,000 | 1.7 |
| MCDOWELL | 40,000 | 513,000 | 320,000 | 270,000 | 0.9 |
| MECKLENBURG | | | | | |
| MITCHELL | | | | | |
| MONTGOMERY | 3,140,000 | 4,440,000 | 4,460,000 | 4,720,000 | 14.7 |
| MOORE | 12,255,000 | 7,600,000 | 7,200,000 | 5,190,000 | 11.5 |
| NASH | 3,810,000 | 3,380,000 | 3,580,000 | 2,870,000 | 8.3 |
| NEW HANOVER | | | | | 0.0 |
| NORTHAMPTON | 1,900,000 | 1,660,000 | 1,720,000 | 1,840,000 | 5.2 |
| ONSIOW | 1,122,000 | 1,060,000 | 1,064,000 | 1,680,000 | 3.2 |
| ORANGE | | | 119,000 | 157,800 | 0.6 |
| OTHER COUNTIES | 2,677,000 | 1,607,000 | 2,633,300 | 6,587,600 | |
| PAMLICO | | | | | |
| PASQUOTANK | | | | | |
| PENDER | 106,000 | 360,000 | 740,000 | 2,195,000 | 3.9 |
| PERQUIMANS | 1,260,000 | 1,160,000 | 1,420,000 | 2,100,000 | 10.0 |
| PERSON | | | | | 0.0 |
| PITT | 1,350,000 | 960,000 | 900,000 | 2,060,000 | 4.9 |
| POLK | | | | 1,200 | 0.0 |
| RANDOLPH | 9,640,000 | 11,830,000 | 10,540,000 | 8,030,000 | 15.9 |
| RICHMOND | 2,540,000 | 5,440,000 | 6,300,000 | 7,070,000 | 23.0 |
| ROBESON | 1,744,000 | 3,840,000 | 4,048,000 | 9,755,900 | 16.0 |
| ROCKINGHAM | | | 110,000 | | 0.0 |
| ROWAN | 380,000 | 61,000 | 332,000 | 927,000 | 2.8 |
| RUTHERFORD | 72,000 | 360,000 | 300,000 | 942,200 | 2.6 |
| SAMPSON | 5,285,000 | 6,900,000 | 7,504,000 | 11,405,000 | 18.8 |
| SCOTLAND | 860,000 | 700,000 | 1,720,000 | 2,480,000 | 12.1 |
| STANLY | 1,454,000 | 3,281,000 | 3,469,000 | 1,938,000 | 7.5 |
| STOKES | | | 135,000 | 285,000 | 1.0 |
| SURRY | 3,100,000 | 4,550,000 | 5,830,000 | 6,240,000 | 18.1 |
| SWAIN | | | | | |
| TRANSYLVANIA | | | | 2,280 | 0.0 |
| TYRRELL | | | | | |
| UNION | 18,210,000 | 18,250,000 | 20,130,000 | 15,420,000 | 37.7 |
| VANCE | | | | | 0.0 |
| WAKE | | | 240,000 | 4,400 | 0.0 |
| WARREN | 495,400 | 653,000 | 120,000 | | 0.0 |
| WASHINGTON | 1,120,000 | 1,120,000 | 260,000 | | |
| WATAUGA | | | | 1,600 | 0.0 |
| WAYNE | 6,460,000 | 5,560,000 | 5,851,700 | 4,506,000 | 12.6 |
| WILKES | 16,960,000 | 17,600,000 | 19,450,000 | 11,255,000 | 23.2 |
| WILSON | 320,000 | | | | 0.0 |
| YADKIN | 1,220,000 | 1,640,000 | | 2,525,000 | 11.7 |
| YANCEY | | | 2,670,000 | 1,100 | 0.0 |

Table 11: County Poultry Inventory Pounds of Plant Available Nitrogen (PAN) Estimates

| County | PAN 1992 (lb) | PAN 2000 (lb) | PAN 2006 (lb) | PAN 2014 (lb) |
|------------|---------------|---------------|---------------|---------------|
| ALAMANCE | 481,023 | 419,269 | 374,928 | 126,917 |
| ALEXANDER | 1,596,292 | 1,470,449 | 1,803,907 | 2,749,708 |
| ALLEGHANY | 9,156 | | | |
| ANSON | 1,044,395 | 1,434,006 | 1,761,717 | 1,817,247 |
| ASHE | | | | 1,759 |
| AVERY | | | | |
| BEAUFORT | | | | |
| BERTIE | 997,952 | 1,016,263 | 1,130,707 | 1,464,883 |
| BLADEN | 230,769 | 384,754 | 664,105 | 940,144 |
| BRUNSWICK | | | | 880 |
| BUNCOMBE | | | | 5,813 |
| BURKE | 109,866 | 300,876 | 178,533 | 334,580 |
| CABARRUS | 37,699 | 75,398 | 245,045 | 139,622 |
| CALDWELL | 233,287 | 128,177 | 36,622 | 57,222 |
| CAMDEN | | | | |
| CARTERET | | | | 817 |
| CASWELL | | | 138,230 | 169,646 |
| CATAWBA | | 183,110 | 205,999 | 551,935 |
| CHATHAM | 2,757,966 | 2,307,434 | 1,934,956 | 1,181,960 |
| CHEROKEE | | | 502,656 | |
| CHOWAN | 91,555 | 128,177 | 137,333 | 116,733 |
| CLAY | | | | |
| CLEVELAND | 471,518 | 408,946 | 530,840 | 1,089,435 |
| COLUMBUS | | | 196,844 | 136,552 |
| CRAVEN | | | | |
| CUMBERLAND | 311,850 | 117,496 | 155,644 | 232,100 |
| CURRITUCK | | | | |
| DARE | | | | |
| DAVIDSON | 155,644 | 224,310 | 385,968 | 338,351 |
| DAVIE | 125,664 | 180,328 | 160,581 | 160,222 |
| DUPLIN | 4,544,375 | 4,146,878 | 4,572,164 | 4,576,631 |
| DURHAM | | | | 1,445 |
| EDGECOMBE | 314,609 | 294,682 | 362,361 | 304,421 |
| FORSYTH | | | | 1,634 |
| FRANKLIN | 598,789 | 425,462 | 194,869 | 77,822 |
| GASTON | | 64,089 | 91,555 | 110,046 |
| GATES | 247,199 | 224,310 | 265,510 | 359,354 |
| GRAHAM | | | | |
| GRANVILLE | | | | 817 |
| GREENE | 388,286 | 530,323 | 380,999 | 543,367 |
| GUILFORD | 69,115 | 108,699 | 155,195 | 210,487 |
| HALIFAX | 297,554 | 265,510 | 296,926 | |
| HARNETT | 306,710 | 1,098,662 | 1,272,617 | 1,123,184 |
| HAYWOOD | | | | 942 |
| HENDERSON | | | | 1,195 |
| HERTFORD | 265,510 | 517,287 | 503,554 | 480,665 |
| HOKE | | | 137,333 | 285,238 |
| HYDE | | | | |
| IREDELL | 1,080,710 | 1,303,585 | 1,023,084 | 1,127,700 |
| JACKSON | | | | 891 |
| JOHNSTON | 237,006 | 783,819 | 759,766 | 507,971 |
| JONES | | | 183,110 | 192,630 |
| LEE | 160,222 | 320,443 | 325,021 | 178,533 |
| LENOIR | 1,119,925 | 802,795 | 478,685 | 500,610 |

| County | PAN 1992 (lb) | PAN 2000 (lb) | PAN 2006 (lb) | PAN 2014 (lb) |
|----------------|---------------|---------------|---------------|---------------|
| LINCOLN | 260,932 | 178,533 | 169,377 | 352,272 |
| MACON | | | | 754 |
| MADISON | | | | 2,388 |
| MARTIN | 187,688 | 128,177 | 187,688 | 116,733 |
| MCDOWELL | 25,133 | 162,555 | 73,244 | 92,156 |
| MECKLENBURG | | | | |
| MITCHELL | | | | |
| MONTGOMERY | 718,708 | 1,016,263 | 1,060,784 | 1,080,351 |
| MOORE | 2,866,935 | 1,859,378 | 1,647,994 | 1,199,912 |
| NASH | 1,794,751 | 1,436,698 | 1,458,510 | 940,505 |
| NEW HANOVER | | | | |
| NORTHAMPTON | 434,887 | 379,954 | 393,687 | 421,154 |
| ONslow | 680,050 | 661,122 | 592,551 | 645,108 |
| ORANGE | | | 74,770 | 98,031 |
| OTHER COUNTIES | 1,682,014 | 1,009,711 | 1,476,014 | 4,022,007 |
| PAMLICO | | | | |
| PASQUOTANK | | | | |
| PENDER | 66,112 | 224,532 | 264,132 | 627,444 |
| PERQUIMANS | 288,399 | 265,510 | 325,021 | 480,665 |
| PERSON | | | | |
| PITT | 848,232 | 219,732 | 205,999 | 471,509 |
| POLK | | | | 754 |
| RANDOLPH | 2,565,969 | 3,262,956 | 2,867,832 | 2,209,443 |
| RICHMOND | 676,130 | 1,245,151 | 1,441,994 | 1,662,175 |
| ROBESON | 598,166 | 1,013,166 | 1,024,452 | 2,262,984 |
| ROCKINGHAM | | | 69,115 | |
| ROWAN | 126,921 | 38,328 | 128,716 | 234,947 |
| RUTHERFORD | 16,480 | 82,400 | 68,666 | 216,537 |
| SAMPSON | 2,902,574 | 3,318,902 | 3,482,881 | 3,981,194 |
| SCOTLAND | 196,844 | 160,222 | 393,687 | 567,642 |
| STANLY | 910,417 | 1,188,077 | 1,099,310 | 521,758 |
| STOKES | | | 84,823 | 179,071 |
| SURRY | 869,326 | 1,221,185 | 1,554,105 | 1,771,772 |
| SWAIN | | | | |
| TRANSYLVANIA | | | | 1,241 |
| TYRRELL | | | | |
| UNION | 6,861,571 | 5,111,159 | 5,573,608 | 4,690,712 |
| VANCE | | | | |
| WAKE | | | 54,933 | 2,286 |
| WARREN | 153,334 | 186,611 | 75,398 | |
| WASHINGTON | 256,355 | 256,355 | 59,511 | |
| WATAUGA | | | | 1,005 |
| WAYNE | 2,561,787 | 2,119,455 | 2,150,859 | 1,674,377 |
| WILKES | 4,417,180 | 4,507,747 | 4,871,275 | 2,877,706 |
| WILSON | 73,244 | | | |
| YADKIN | 558,846 | 694,922 | | 1,075,235 |
| YANCEY | | | 1,270,194 | 691 |

Table 12: County Poultry Inventory Pounds of Phosphorus (P₂O₅) Estimates

| County | P ₂ O ₅ 1992 (lb) | P ₂ O ₅ 2000 (lb) | P ₂ O ₅ 2006 (lb) | P ₂ O ₅ 2014 (lb) |
|------------|---|---|---|---|
| ALAMANCE | 730,836 | 641,844 | 584,640 | 203,436 |
| ALEXANDER | 2,347,200 | 2,249,532 | 2,777,760 | 4,059,540 |
| ALLEGHANY | 11,520 | | | |
| ANSON | 1,559,736 | 1,870,668 | 2,402,532 | 2,497,975 |
| ASHE | | | | 3,004 |
| AVERY | | | | |
| BEAUFORT | | | | |
| BERTIE | 1,255,680 | 1,278,720 | 1,422,720 | 1,843,200 |
| BLADEN | 374,514 | 565,992 | 916,692 | 1,342,140 |
| BRUNSWICK | | | | 1,502 |
| BUNCOMBE | | | | 9,798 |
| BURKE | 138,240 | 406,800 | 224,640 | 463,320 |
| CABARRUS | 64,368 | 128,736 | 346,428 | 175,680 |
| CALDWELL | 309,902 | 161,280 | 46,080 | 72,000 |
| CAMDEN | | | | |
| CARTERET | | | | 1,395 |
| CASWELL | | | 236,016 | 289,656 |
| CATAWBA | | 230,400 | 259,200 | 716,206 |
| CHATHAM | 3,648,024 | 3,174,600 | 2,637,583 | 1,621,260 |
| CHEROKEE | | | 858,240 | |
| CHOWAN | 115,200 | 161,280 | 172,800 | 146,880 |
| CLAY | | | | |
| CLEVELAND | 714,766 | 562,536 | 713,088 | 1,400,810 |
| COLUMBUS | | | 247,680 | 172,495 |
| CRAVEN | | | | |
| CUMBERLAND | 506,100 | 200,614 | 195,840 | 341,620 |
| CURRITUCK | | | | |
| DARE | | | | |
| DAVIDSON | 195,840 | 282,240 | 527,414 | 455,364 |
| DAVIE | 214,560 | 307,894 | 255,672 | 273,564 |
| DUPLIN | 7,011,677 | 6,233,652 | 6,955,786 | 6,347,928 |
| DURHAM | | | | 2,467 |
| EDGECOMBE | 424,080 | 402,394 | 491,220 | 383,040 |
| FORSYTH | | | | 2,789 |
| FRANKLIN | 979,200 | 675,036 | 310,104 | 97,920 |
| GASTON | | 80,640 | 115,200 | 143,687 |
| GATES | 311,040 | 282,240 | 334,080 | 452,160 |
| GRAHAM | | | | |
| GRANVILLE | | | | 1,395 |
| GREENE | 590,086 | 785,544 | 564,907 | 829,248 |
| GUILFORD | 118,008 | 185,594 | 264,982 | 359,388 |
| HALIFAX | 374,400 | 334,080 | 402,113 | |
| HARNETT | 385,920 | 1,382,400 | 1,601,280 | 1,413,989 |
| HAYWOOD | | | | 1,609 |
| HENDERSON | | | | 2,012 |
| HERTFORD | 334,080 | 650,880 | 633,600 | 604,800 |
| HOKE | | | 172,800 | 375,278 |
| HYDE | | | | |
| IREDELL | 1,845,216 | 2,199,024 | 1,730,376 | 1,887,408 |
| JACKSON | | | | 1,460 |
| JOHNSTON | 384,636 | 1,081,764 | 1,016,021 | 674,806 |
| JONES | | | 230,400 | 264,211 |
| LEE | 201,600 | 403,200 | 408,960 | 224,640 |
| LENOIR | 1,793,088 | 1,243,176 | 735,125 | 785,160 |

| County | P ₂ O ₅ 1992 (lb) | P ₂ O ₅ 2000 (lb) | P ₂ O ₅ 2006 (lb) | P ₂ O ₅ 2014 (lb) |
|----------------|---|---|---|---|
| LINCOLN | 328,320 | 224,640 | 213,120 | 444,180 |
| MACON | | | | 1,287 |
| MADISON | | | | 4,077 |
| MARTIN | 236,160 | 161,280 | 236,160 | 146,880 |
| MCDOWELL | 42,912 | 236,426 | 92,160 | 137,405 |
| MECKLENBURG | | | | |
| MITCHELL | | | | |
| MONTGOMERY | 904,320 | 1,278,720 | 1,362,960 | 1,359,360 |
| MOORE | 3,651,084 | 2,424,240 | 2,073,600 | 1,518,264 |
| NASH | 2,910,168 | 2,276,208 | 2,286,720 | 1,383,768 |
| NEW HANOVER | | | | |
| NORTHAMPTON | 547,200 | 478,080 | 495,360 | 529,920 |
| ONSWLOW | 1,099,478 | 1,072,932 | 946,625 | 961,812 |
| ORANGE | | | 127,663 | 167,090 |
| OTHER COUNTIES | 2,871,886 | 1,723,989 | 2,443,090 | 6,824,606 |
| PAMLICO | | | | |
| PASQUOTANK | | | | |
| PENDER | 107,293 | 364,392 | 386,928 | 869,070 |
| PERQUIMANS | 362,880 | 334,080 | 408,960 | 604,800 |
| PERSON | | | | |
| PITT | 1,448,280 | 276,480 | 259,200 | 593,280 |
| POLK | | | | 1,287 |
| RANDOLPH | 3,482,640 | 4,497,912 | 3,930,192 | 3,042,504 |
| RICHMOND | 905,328 | 1,566,720 | 1,814,400 | 2,122,488 |
| ROBESON | 867,269 | 1,352,148 | 1,345,426 | 2,864,781 |
| ROCKINGHAM | | | 118,008 | |
| ROWAN | 187,920 | 65,441 | 199,210 | 311,710 |
| RUTHERFORD | 20,736 | 103,680 | 86,400 | 273,080 |
| SAMPSON | 4,640,124 | 5,205,192 | 5,431,553 | 5,829,444 |
| SCOTLAND | 247,680 | 201,600 | 495,360 | 714,240 |
| STANLY | 1,518,401 | 1,773,845 | 1,578,101 | 701,536 |
| STOKES | | | 144,828 | 305,748 |
| SURRY | 1,206,720 | 1,663,560 | 2,110,680 | 2,472,048 |
| SWAIN | | | | |
| TRANSYLVANIA | | | | 2,069 |
| TYRRELL | | | | |
| UNION | 10,239,912 | 7,038,468 | 7,645,116 | 6,665,916 |
| VANCE | | | | |
| WAKE | | | 69,120 | 3,779 |
| WARREN | 221,155 | 261,050 | 128,736 | |
| WASHINGTON | 322,560 | 322,560 | 74,880 | |
| WATAUGA | | | | 1,716 |
| WAYNE | 3,862,968 | 3,176,520 | 3,190,020 | 2,488,973 |
| WILKES | 5,936,112 | 6,010,560 | 6,425,640 | 3,833,964 |
| WILSON | 92,160 | | | |
| YADKIN | 900,720 | 1,100,160 | | 1,704,276 |
| YANCEY | | | 2,063,880 | 1,180 |

Appendix C - Swine

The following maps show the swine numbers based on DWR permits in 2006 and 2015 and the estimated available nutrients produced by county and river basin. Duplin and Sampson counties house the majority of the state's swine population, each with over 2 million swine in 2006 and 2014 (Figures 17 & 18). Duplin and Sampson counties are both in the lower portion of Cape Fear River Basin.

In 2006, 20,027,418 pounds (lb) of plant available nitrogen (PAN) were produced and an estimated 14,050,526 pounds (lb) of phosphorus (P₂O₅) were produced statewide (Figures 19 & 21). In 2015, 16,740,186 lb of PAN and an estimated 11,741,819 lb of P₂O₅ were produced statewide (Figures 20 & 22). The decrease in nutrients produced between 2006 and 2015 is because of the 2.8% population drop from 9.9 million to 9.6 million swine. The coastal basins, predominately the Cape Fear Basin, receive the highest nutrient loads from swine waste. Table 13 shows the swine inventory change between 2006 and 2015 and the amount of nutrients produced per basin. Table 14 lists the counties with permitted swine facilities and their associated nutrient production.

Table 13: 2006 and 2015 Swine Numbers and Plant Available Nitrogen (PAN) and Phosphorus (P₂O₅) Produced per Basin

| River Basin | Swine Numbers 2006 | Swine Numbers 2015 | Inventory % change 2006-15 | PAN 2006 (lb) | PAN 2015 (lb) | P ₂ O ₅ 2006 (lb) | P ₂ O ₅ 2015 (lb) |
|----------------------|--------------------|--------------------|----------------------------|---------------|---------------|---|---|
| Broad | 850 | - | - | 17,634 | - | 12,469 | - |
| Catawba | 6,741 | 260 | -96 | 35,967 | 5,394 | 24,890 | 3,814 |
| Chowan | 152,628 | 173,736 | 14 | 613,608 | 349,883 | 430,482 | 243,358 |
| Cape Fear | 5,820,698 | 5,772,082 | -1 | 10,373,656 | 9,574,482 | 7,281,852 | 6,719,394 |
| French Broad | 925 | - | - | 5,976 | - | 4,140 | - |
| Lumber | 708,788 | 676,461 | -5 | 1,692,819 | 1,392,718 | 1,185,955 | 974,801 |
| Neuse | 1,941,552 | 1,953,358 | 1 | 3,794,072 | 3,309,586 | 2,664,535 | 2,323,652 |
| New | 400 | - | - | 1,691 | - | 1,153 | - |
| Pasquotank | 166,359 | 78,958 | -53 | 538,549 | 172,510 | 376,102 | 120,766 |
| Roanoke | 60,966 | 38,697 | -37 | 246,535 | 116,990 | 172,617 | 81,296 |
| Tar-Pamlico | 646,128 | 571,108 | -12 | 1,779,291 | 1,166,176 | 1,247,256 | 816,405 |
| White Oak | 205,253 | 211,799 | 3 | 368,789 | 345,432 | 259,085 | 243,471 |
| Yadkin-PeeDee | 227,968 | 189,731 | -17 | 555,048 | 307,016 | 387,381 | 214,863 |

Figure 17: 2006 Swine Population by County

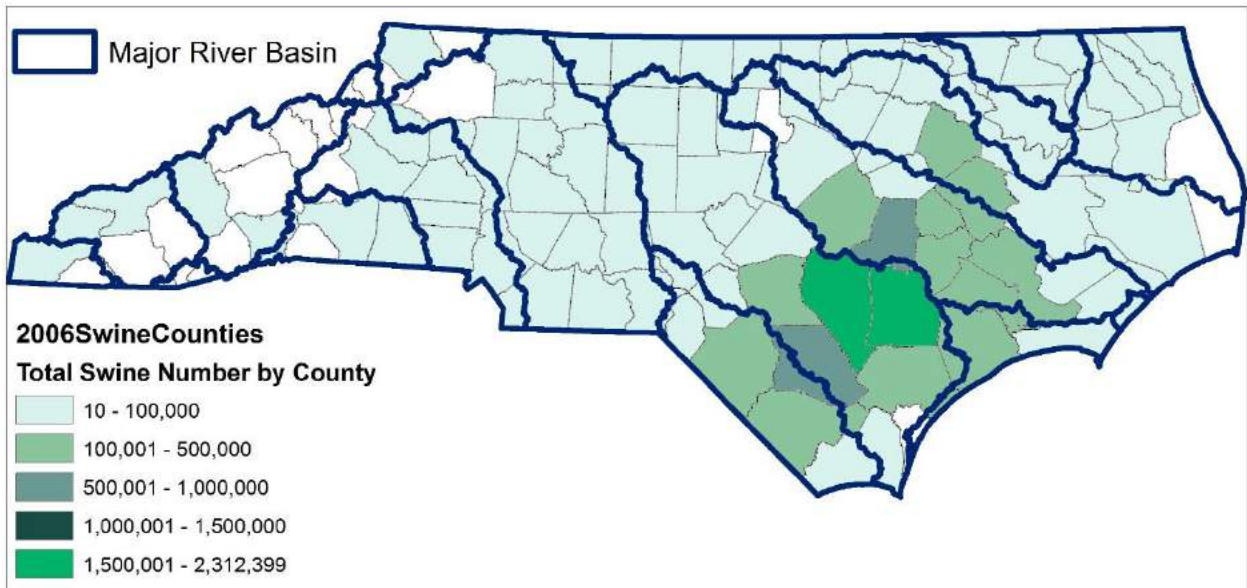


Figure 18: 2015 Swine Population by County

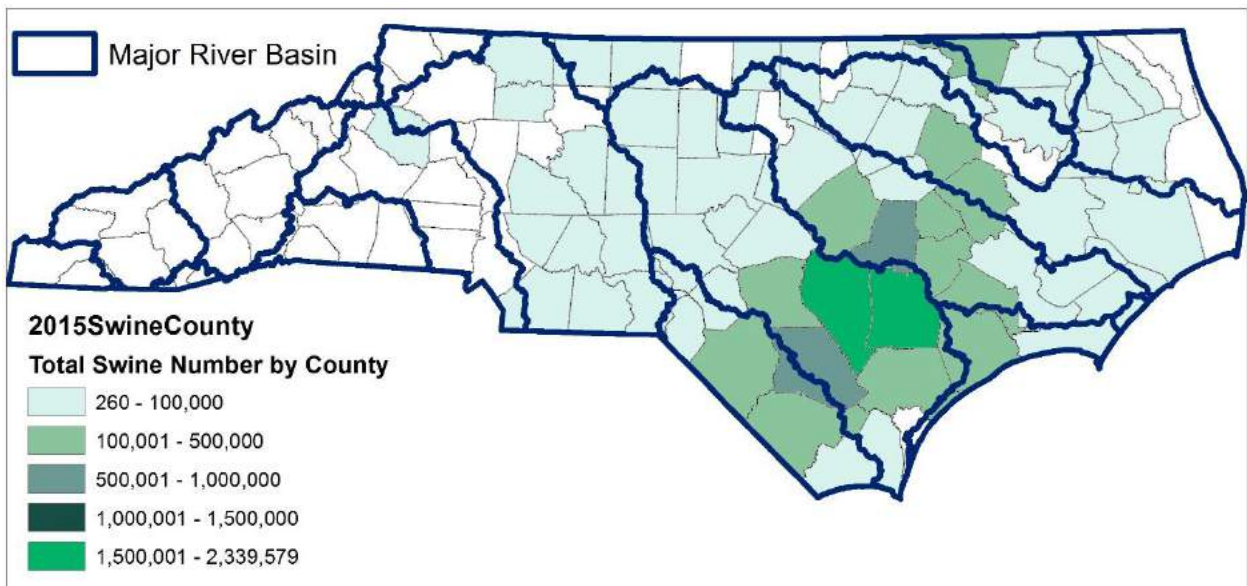


Figure 19: 2006 Estimated Total Pounds of Plant Available Nitrogen (PAN) per County Produced by Swine

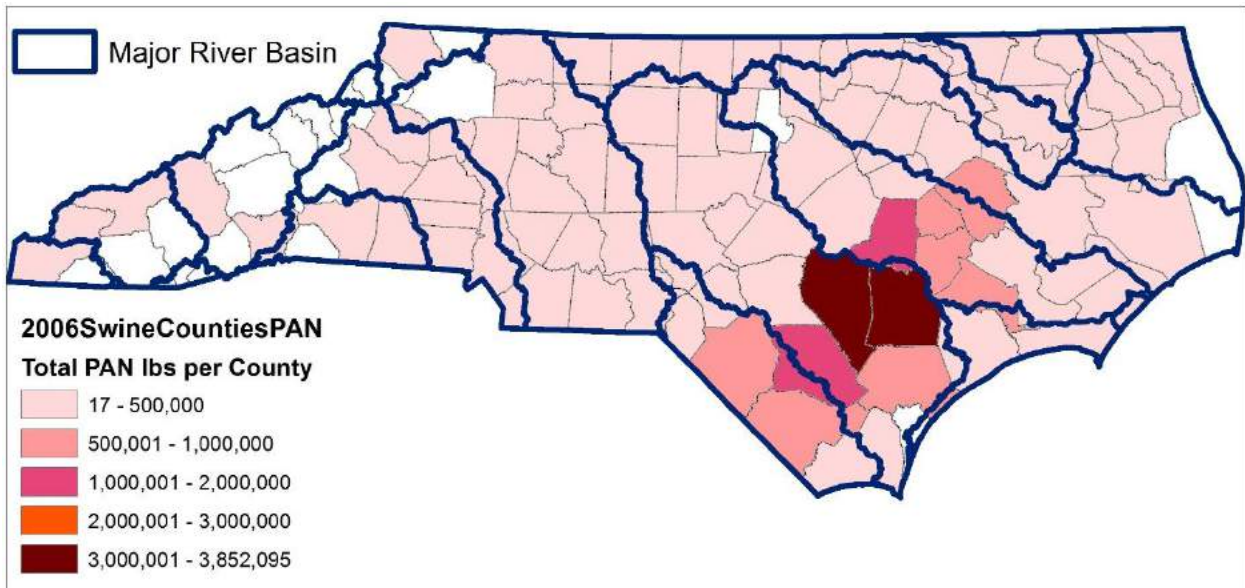


Figure 20: 2015 Estimated Total Pounds of Plant Available Nitrogen (PAN) per County Produced by Swine

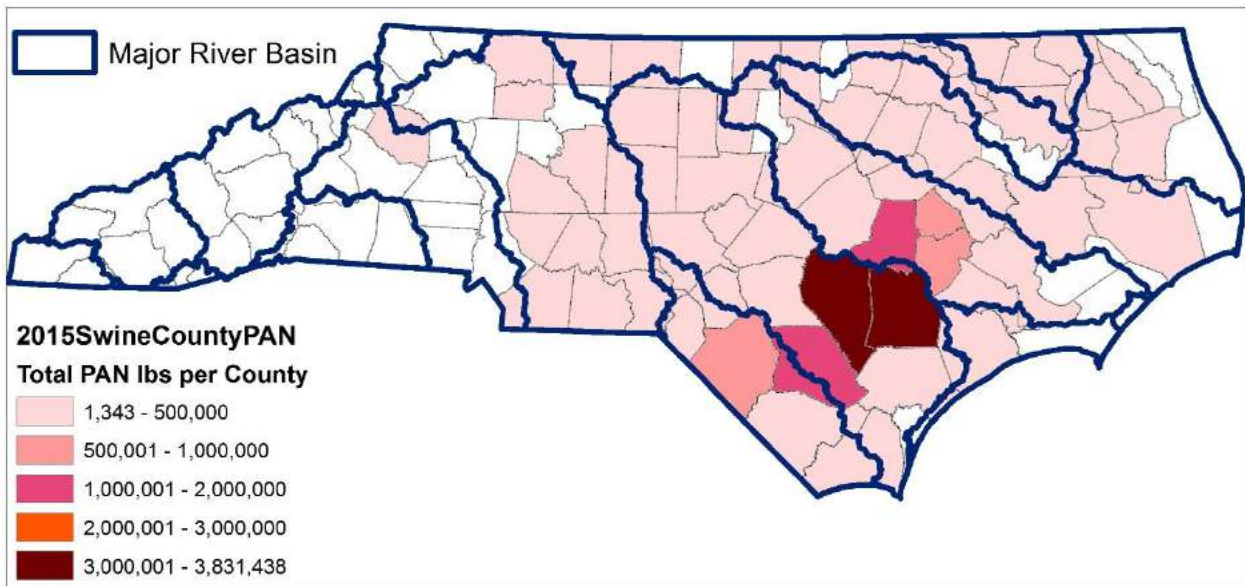


Figure 21: 2006 Estimated Total Pounds of Phosphorus (P_2O_5) per County Produced by Swine

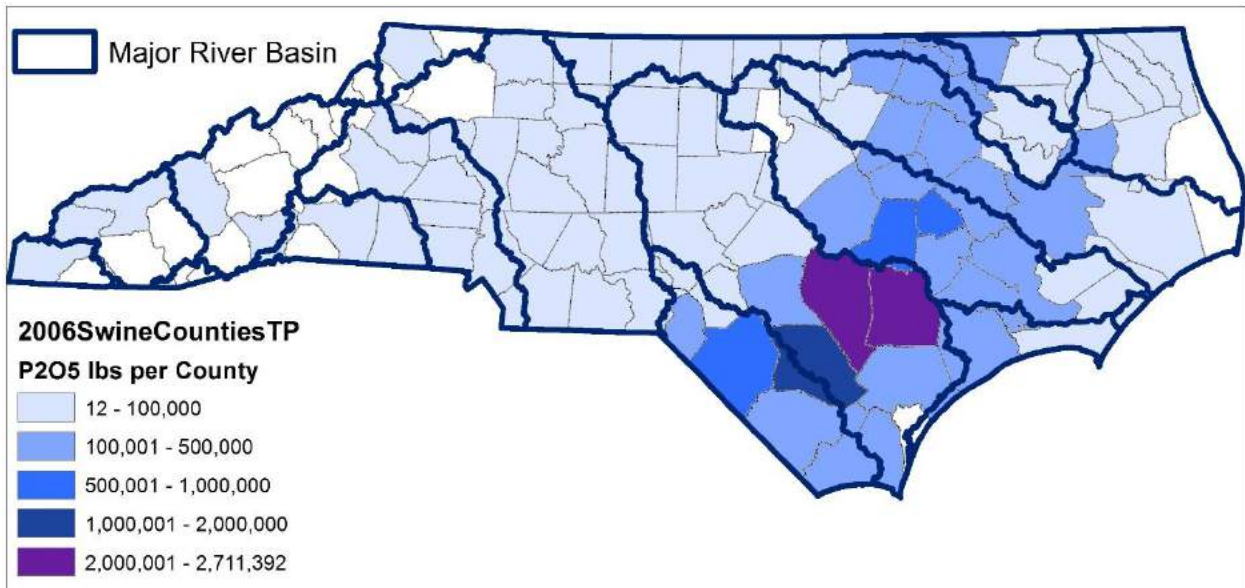


Figure 22: 2015 Estimated Total Pounds of Phosphorus (P_2O_5) per County Produced by Swine

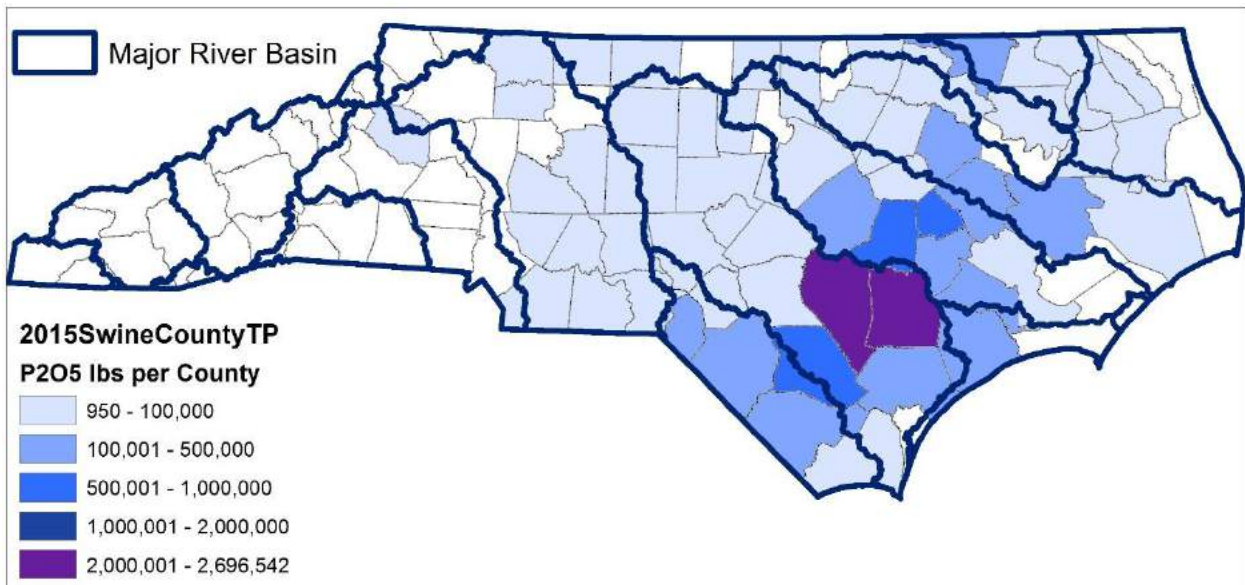


Table 14: County Swine Population and Pounds of Plant Available Nitrogen (PAN) and Phosphorus (P₂O₅) Produced

| County | 2006 Swine Number of Head | 2006 PAN (lb) | 2006 P ₂ O ₅ (lb) | 2015 Swine Number of Head | 2015 PAN (lb) | 2015 P ₂ O ₅ (lb) |
|-------------|---------------------------|---------------|---|---------------------------|---------------|---|
| ALAMANCE | 900 | 2,370 | 1,643 | 900 | 2,370 | 1,643 |
| ALEXANDER | 275 | 1,163 | 793 | | | |
| ANSON | 48,018 | 81,768 | 56,494 | 45,238 | 67,699 | 46,749 |
| ASHE | 400 | 1,691 | 1,153 | | | |
| BEAUFORT | 80,221 | 289,547 | 201,766 | 54,290 | 149,378 | 103,059 |
| BERTIE | 32,348 | 135,528 | 94,659 | 29,925 | 80,535 | 55,801 |
| BLADEN | 847,083 | 1,573,223 | 1,102,254 | 755,370 | 1,316,763 | 920,183 |
| BRUNSWICK | 80,451 | 166,301 | 116,094 | 69,966 | 118,003 | 82,699 |
| BURKE | 2,800 | 11,838 | 8,072 | | | |
| CABARRUS | 3,384 | 14,307 | 9,755 | 2,000 | 8,456 | 5,765 |
| CALDWELL | 960 | 7,397 | 5,198 | 260 | 5,394 | 3,814 |
| CAMDEN | 9,489 | 30,215 | 20,697 | | | |
| CARTERET | 1,051 | 6,982 | 4,850 | | | |
| CASWELL | 65 | 1,349 | 953 | | | |
| CATAWBA | 1,200 | 3,877 | 2,667 | | | |
| CHATHAM | 10,598 | 22,657 | 15,882 | 9,300 | 17,070 | 12,070 |
| CHEROKEE | 60 | 1,245 | 880 | | | |
| CHOWAN | 21,639 | 56,238 | 39,282 | 10,816 | 19,569 | 13,832 |
| CLEVELAND | 450 | 9,336 | 6,601 | | | |
| COLUMBUS | 250,779 | 512,589 | 360,045 | 240,796 | 453,653 | 318,543 |
| CRAVEN | 119,881 | 189,327 | 131,790 | 97,481 | 140,383 | 97,728 |
| CUMBERLAND | 127,689 | 296,917 | 207,216 | 104,801 | 143,284 | 99,816 |
| CURRITUCK | 16,112 | 71,662 | 49,634 | | | |
| DAVIDSON | 4,077 | 44,712 | 31,468 | 787 | 1,445 | 1,021 |
| DAVIE | 3,775 | 19,677 | 13,534 | | | |
| DUPLIN | 2,312,399 | 3,852,095 | 2,711,392 | 2,339,579 | 3,831,438 | 2,696,542 |
| EDGECOMBE | 117,221 | 300,266 | 210,287 | 119,387 | 269,256 | 188,388 |
| FORSYTH | 10 | 42 | 29 | | | |
| FRANKLIN | 26,202 | 112,555 | 78,479 | 36,643 | 43,082 | 30,230 |
| GASTON | 200 | 846 | 577 | | | |
| GATES | 32,637 | 132,423 | 92,643 | 20,852 | 37,786 | 26,203 |
| GRAHAM | 200 | 846 | 577 | | | |
| GRANVILLE | 2,216 | 11,593 | 8,165 | 1,256 | 2,305 | 1,630 |
| GREENE | 474,968 | 871,771 | 613,763 | 438,932 | 718,959 | 505,994 |
| GUILFORD | 14,870 | 24,797 | 17,427 | 5,820 | 12,135 | 8,580 |
| HALIFAX | 49,321 | 153,673 | 108,268 | 44,157 | 106,773 | 74,759 |
| HARNETT | 56,141 | 138,619 | 97,370 | 59,959 | 130,792 | 91,836 |
| HAYWOOD | 125 | 2,593 | 1,834 | | | |
| HENDERSON | 800 | 3,382 | 2,306 | | | |
| HERTFORD | 15,592 | 103,874 | 73,190 | 21,655 | 72,436 | 49,758 |
| HOKE | 69,163 | 141,737 | 99,186 | 66,878 | 132,154 | 92,409 |
| HYDE | 6,876 | 31,684 | 22,371 | 900 | 1,652 | 1,168 |
| IREDELL | 520 | 4,181 | 2,913 | | | |
| JOHNSTON | 212,970 | 397,799 | 279,188 | 212,195 | 341,740 | 239,787 |
| JONES | 255,355 | 530,244 | 371,323 | 250,655 | 447,299 | 312,140 |
| LEE | 4,742 | 3,760 | 2,658 | 3,552 | 1,343 | 950 |
| LENOIR | 299,599 | 545,285 | 384,159 | 299,397 | 506,921 | 357,232 |
| LINCOLN | 1,260 | 10,829 | 7,572 | | | |
| MARTIN | 14,216 | 53,230 | 37,473 | | | |
| MECKLENBURG | 46 | 17 | 12 | | | |
| MONTGOMERY | 39,363 | 37,457 | 26,485 | 22,908 | 8,663 | 6,126 |
| MOORE | 25,736 | 74,559 | 52,170 | 25,387 | 64,311 | 45,037 |

| | | | | | | |
|---------------------|-----------|-----------|-----------|-----------|-----------|-----------|
| NASH | 86,142 | 168,175 | 117,879 | 65,552 | 112,324 | 79,055 |
| NORTHAMPTON | 82,760 | 321,073 | 225,367 | 120,413 | 220,092 | 153,564 |
| ONslow | 204,202 | 361,807 | 254,235 | 211,799 | 345,432 | 243,471 |
| ORANGE | 4,850 | 12,268 | 8,625 | 4,000 | 7,342 | 5,191 |
| PAMLICO | 3,049 | 8,841 | 6,132 | | | |
| PASQUOTANK | 3,424 | 9,151 | 6,349 | 1,260 | 3,509 | 2,428 |
| PENDER | 264,749 | 527,260 | 368,283 | 254,316 | 487,330 | 339,397 |
| PERQUIMANS | 26,105 | 66,447 | 46,716 | 5,437 | 7,080 | 4,987 |
| PERSON | 9,295 | 36,025 | 25,355 | 3,827 | 17,120 | 12,074 |
| PITT | 255,639 | 543,271 | 380,981 | 241,223 | 401,984 | 282,039 |
| RANDOLPH | 33,878 | 78,832 | 55,586 | 32,318 | 62,189 | 43,844 |
| RICHMOND | 50,328 | 117,585 | 81,923 | 69,020 | 104,143 | 73,006 |
| ROBESON | 300,360 | 781,211 | 546,635 | 285,367 | 619,763 | 433,217 |
| ROCKINGHAM | 4,217 | 13,769 | 9,485 | 4,145 | 13,218 | 9,096 |
| ROWAN | 4,280 | 23,480 | 16,314 | 1,578 | 12,063 | 8,530 |
| RUTHERFORD | 400 | 8,299 | 5,868 | | | |
| SAMPSON | 2,052,750 | 3,636,829 | 2,550,782 | 2,113,902 | 3,373,304 | 2,367,086 |
| SCOTLAND | 77,198 | 232,718 | 163,181 | 80,332 | 201,300 | 140,342 |
| STANLY | 4,370 | 13,119 | 9,212 | 3,390 | 5,056 | 3,575 |
| STOKES | 825 | 6,634 | 4,691 | 800 | 6,116 | 4,324 |
| SURRY | 18,952 | 34,696 | 24,276 | 17,730 | 27,093 | 18,900 |
| SWAIN | 400 | 1,691 | 1,153 | | | |
| TRANSYLVANIA | 24,691 | 112,000 | 77,356 | 9,542 | 40,343 | 27,507 |
| UNION | 36,381 | 124,954 | 87,807 | 9,800 | 40,681 | 28,764 |
| VANCE | 5,090 | 3,805 | 2,690 | | | |
| WAKE | 2,843 | 19,203 | 13,471 | 263 | 5,456 | 3,858 |
| WARREN | 17,200 | 164,723 | 116,370 | 7,700 | 79,422 | 56,077 |
| WASHINGTON | 86,538 | 249,073 | 175,351 | 62,719 | 121,578 | 85,845 |
| WAYNE | 524,237 | 1,076,015 | 755,248 | 611,635 | 1,100,559 | 773,003 |
| WILSON | 43,800 | 143,318 | 100,836 | 38,800 | 40,926 | 28,719 |
| YADKIN | 14,510 | 39,070 | 27,171 | 17,280 | 31,717 | 22,426 |

Appendix D- Cattle

The following maps show the cattle numbers based on DWR permits in 2006 and 2015 and the estimated available nutrients produced by county and river basin. In 2006, Iredell County had over 19 thousand cattle, by 2014 Iredell County had over 24 thousand cattle (Figures 23 & 24). The county statistics also lend to the Yadkin-Pee Dee and Cape Fear river basins as having the largest cattle populations. Table 15 lists the cattle inventory change between 2006 and 2015 and the amount of nutrients produced per basin. Table 16 lists the counties with permitted cattle facilities and their associated nutrient production.

In 2006, 11,200,996 pounds (lb) of plant available nitrogen (PAN) were produced and an estimated 14,020,959 lb of P₂O₅ were produced statewide with Iredell County producing over 1.6 million lb PAN and over 2 million lb of P₂O₅ (Figures 25 & 27). The Yadkin-Pee Dee Basin has the highest estimated pounds of PAN and P₂O₅ produced.

In 2015, 6,609,687 lb of PAN and an estimated 8,269,901 lb of P₂O₅ were produced statewide. This is a decrease from the 2006 levels because the number of cattle with DWR permits statewide decreased from approximately 161 thousand to approximately 95 thousand. The decline in cattle numbers is also indicated in the NC Department of Agriculture & Consumer Services Livestock Statistics. In 2015, cattle in Iredell County produced an estimated 2 million lb PAN and an estimated 2.6 million lb of P₂O₅ (Figures 26 & 28). The highest amounts of phosphorus produced are in the Yadkin-Pee Dee Basin.

Table 15: Cattle Inventory change and Nutrients Produced per Basin.

| River Basin | Cattle Numbers 2006 | Cattle Numbers 2015 | Inventory % change 2006-15 (Δ %) | PAN 2006 (lb) | PAN 2015 (lb) | P ₂ O ₅ 2006 (lb) | P ₂ O ₅ 2015 (lb) |
|----------------------|---------------------|---------------------|----------------------------------|---------------|---------------|---|---|
| Broad | 3,250 | 840 | -74 | 190,082 | 66,231 | 238,156 | 82,789 |
| Catawba | 19,133 | 9,166 | -52 | 1,610,902 | 760,065 | 2,014,581 | 950,317 |
| Chowan | 938 | 60 | -94 | 13,413 | 858 | 17,128 | 1,096 |
| Cape Fear | 28,078 | 31,788 | 13 | 1,952,611 | 1,726,861 | 2,444,192 | 2,163,423 |
| French Broad | 13,361 | 4,455 | -67 | 934,131 | 343,484 | 1,169,313 | 429,683 |
| Lumber | 3,090 | | | 275,561 | | 344,540 | |
| Neuse | 8,398 | 1,437 | -83 | 566,255 | 136,802 | 708,929 | 171,003 |
| New | 5,573 | 2,583 | -54 | 415,716 | 192,022 | 520,176 | 240,284 |
| Pasquotank | 120 | 120 | 0 | 1,716 | 1,716 | 2,191 | 2,191 |
| Roanoke | 6,506 | 1,644 | -75 | 357,902 | 130,216 | 448,622 | 162,896 |
| Tar-Pamlico | 16,226 | 3,625 | -78 | 508,305 | 126,317 | 640,314 | 158,836 |
| White Oak | 100 | | | 9,520 | | 11,900 | |
| Yadkin-PeeDee | 53,255 | 38,881 | -27 | 4,181,428 | 3,106,075 | 5,230,821 | 3,883,584 |

Figure 23: 2006 Cattle Population by County

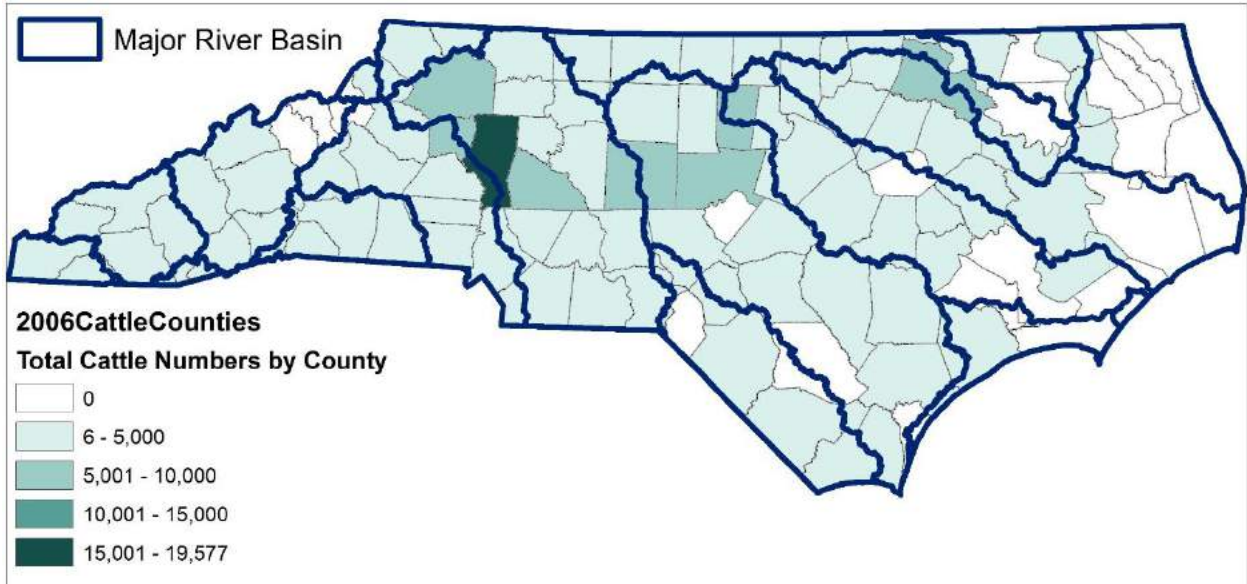


Figure 24: 2015 Cattle Population by County

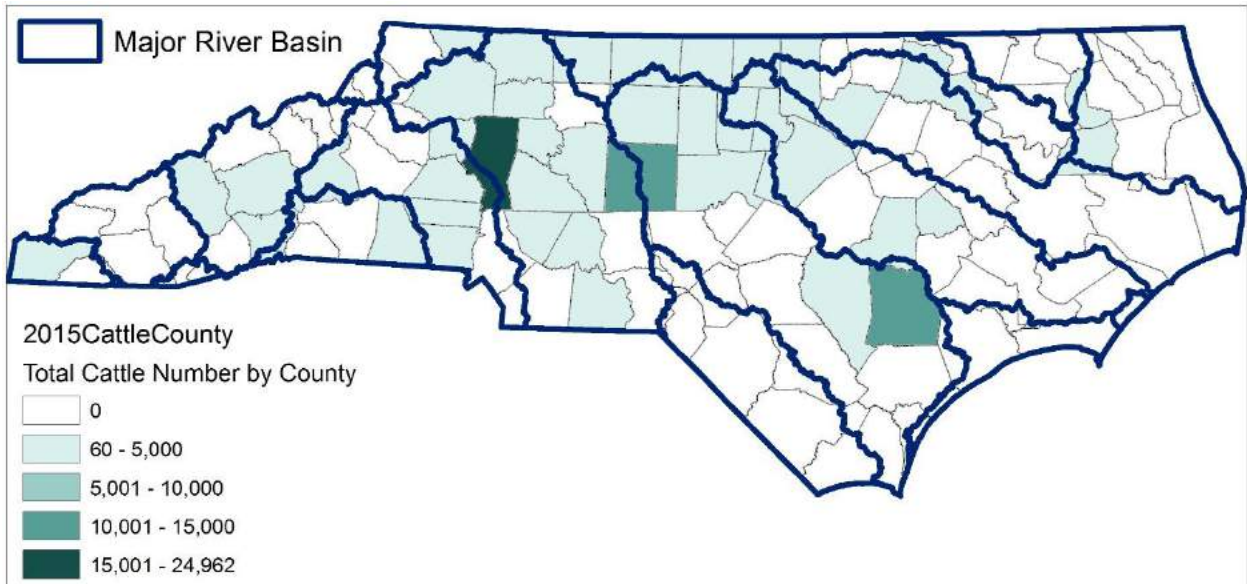


Figure 25: 2006 Estimated Total lb PAN per County Produced by Cattle

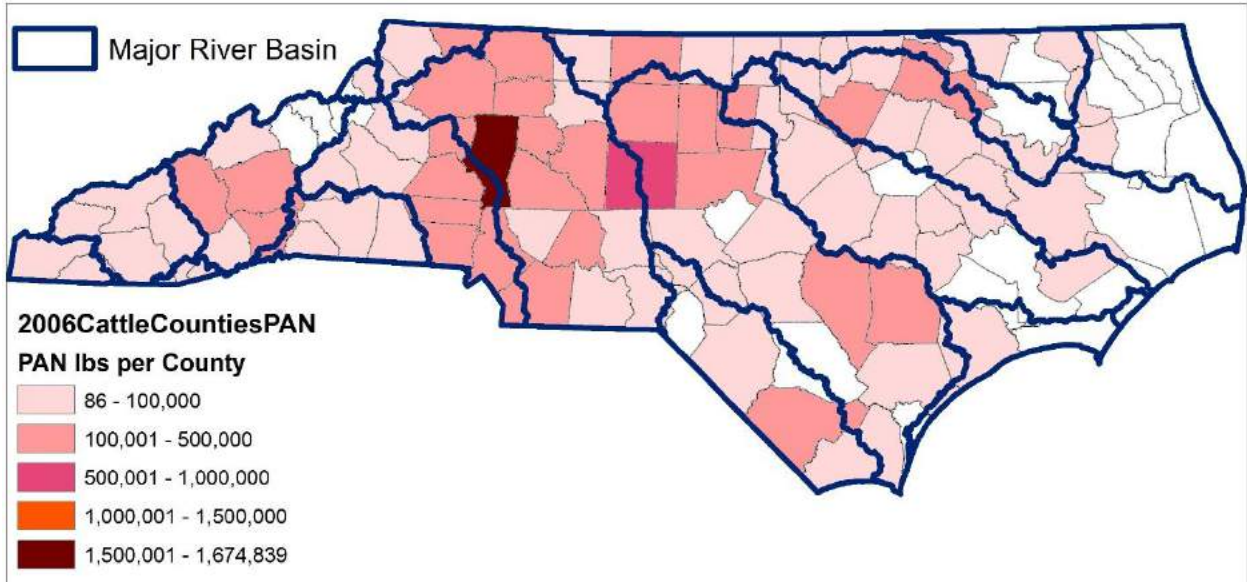


Figure 26: 2015 Estimated Total lb PAN per County Produced by Cattle

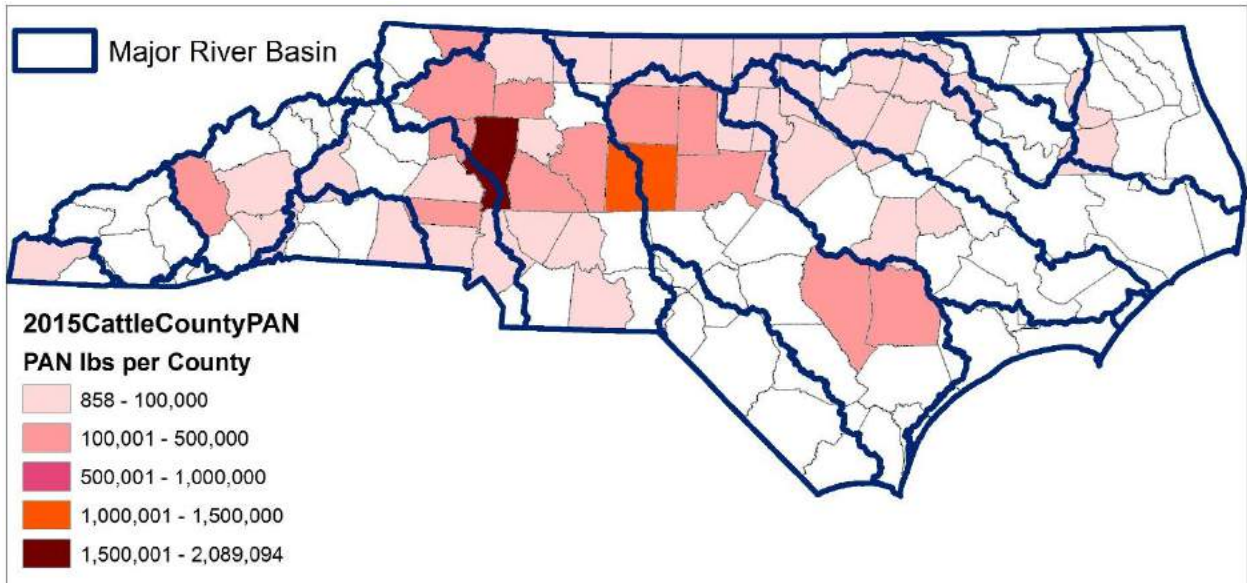


Figure 27: 2006 Estimated Total lb P₂O₅ per County Produced by Cattle

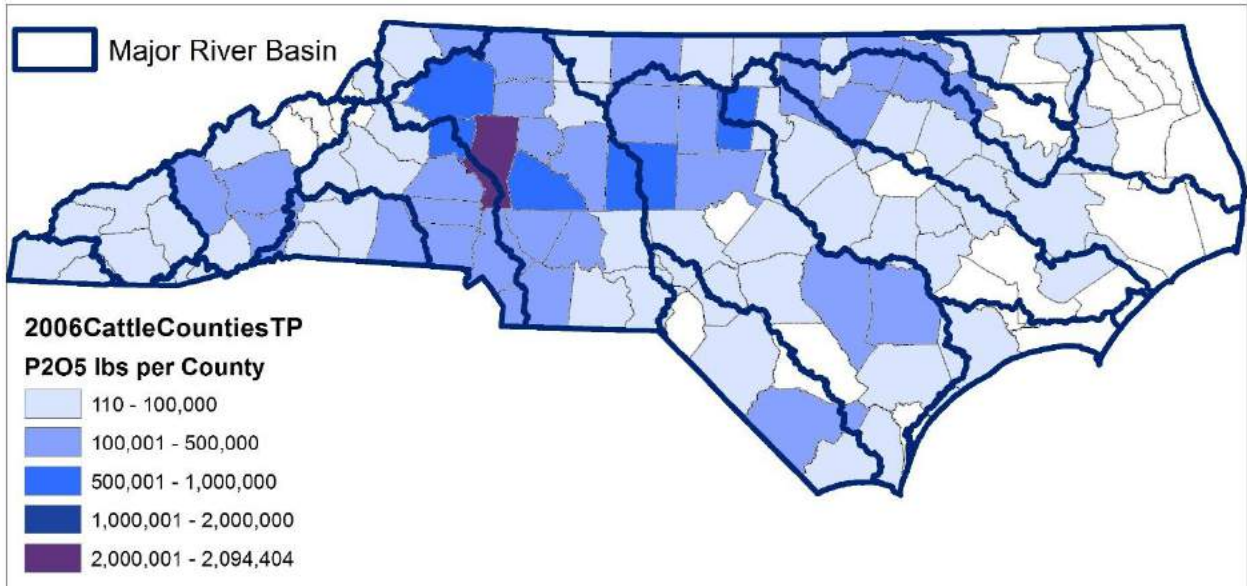


Figure 28: 2015 Estimated Total lb P₂O₅ per County Produced by Cattle

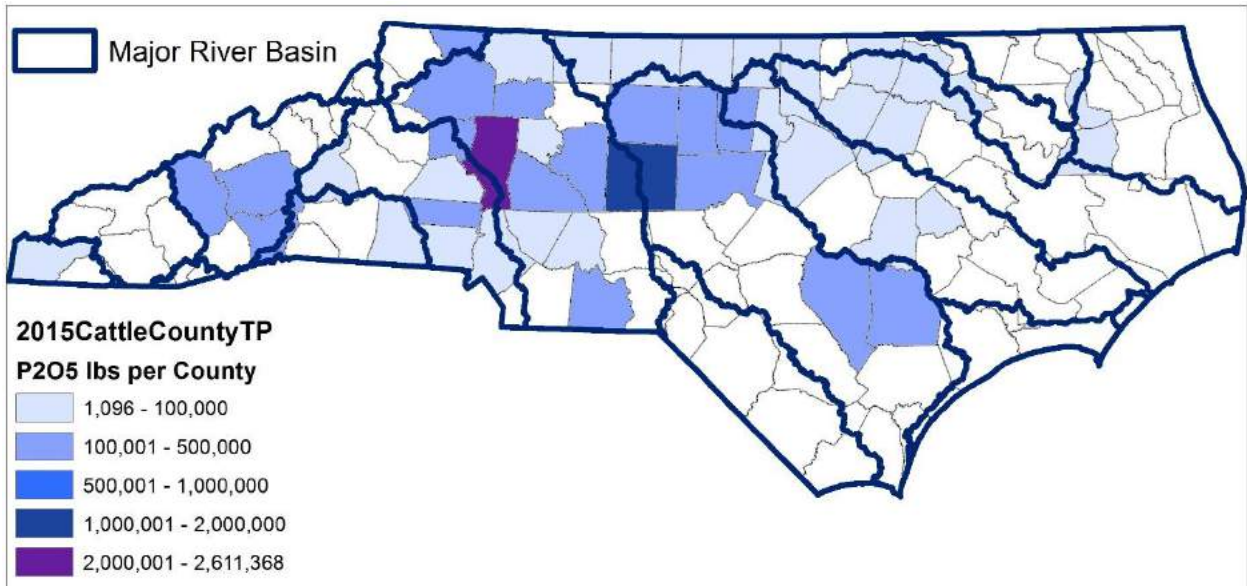


Table 16: Cattle Numbers per County and Plant Available Nitrogen (PAN) and Phosphorus (P₂O₅) Produced

| County | 2006 Cattle Number of Head | 2006 PAN (lb) | 2006 P ₂ O ₅ (lb) | 2015 Cattle Number of Head | 2015 PAN (lb) | 2015 P ₂ O ₅ (lb) |
|-------------|----------------------------|---------------|---|----------------------------|---------------|---|
| ALAMANCE | 4,325 | 345,159 | 431,766 | 1,425 | 111,390 | 139,353 |
| ALEXANDER | 5,018 | 442,522 | 553,320 | 2,950 | 280,840 | 351,050 |
| ALLEGHANY | 4,544 | 398,574 | 498,364 | 2,583 | 192,022 | 240,284 |
| ANSON | 320 | 30,464 | 38,080 | 1,000 | 86,800 | 108,500 |
| ASHE | 1,029 | 17,142 | 21,812 | | | |
| BEAUFORT | 290 | 27,608 | 34,510 | | | |
| BRUNSWICK | 170 | 16,184 | 20,230 | | | |
| BUNCOMBE | 3,517 | 313,301 | 391,771 | 1,210 | 94,375 | 118,113 |
| BURKE | 461 | 35,797 | 44,785 | | | |
| CABARRUS | 1,798 | 88,813 | 111,409 | 220 | 20,944 | 26,180 |
| CALDWELL | 800 | 75,040 | 93,800 | | | |
| CASWELL | 680 | 64,736 | 80,920 | 400 | 38,080 | 47,600 |
| CATAWBA | 3,160 | 271,708 | 339,774 | 560 | 53,312 | 66,640 |
| CATHAM | 5,487 | 298,674 | 374,407 | 3,522 | 138,741 | 174,116 |
| CHEROKEE | 835 | 53,604 | 67,128 | 200 | 19,040 | 23,800 |
| CHOWAN | 92 | 1,316 | 1,680 | 60 | 858 | 1,096 |
| CLAY | 1,317 | 63,166 | 79,254 | | | |
| CLEVELAND | 1,490 | 95,340 | 119,382 | 840 | 66,231 | 82,789 |
| COLUMBUS | 2,690 | 256,088 | 320,110 | | | |
| CUMBERLAND | 1,010 | 18,488 | 23,480 | | | |
| DAVIDSON | 3,072 | 292,454 | 365,568 | 1,925 | 170,797 | 213,497 |
| DAVIE | 3,855 | 266,680 | 333,827 | 675 | 39,990 | 50,103 |
| DUPLIN | 2,035 | 111,214 | 139,410 | 10,514 | 130,273 | 166,349 |
| DURHAM | 520 | 7,436 | 9,495 | 660 | 22,688 | 28,514 |
| EDGECOMBE | 850 | 12,155 | 15,521 | | | |
| FORSYTH | 391 | 23,066 | 28,900 | | | |
| FRANKLIN | 3,405 | 109,367 | 137,730 | 1,690 | 20,982 | 26,792 |
| GASTON | 3,213 | 258,551 | 323,414 | 861 | 76,252 | 95,315 |
| GATES | 255 | 3,647 | 4,656 | | | |
| GRAHAM | 830 | 11,869 | 15,156 | | | |
| GRANVILLE | 1,195 | 99,202 | 124,072 | 700 | 66,640 | 83,300 |
| GREENE | 125 | 1,788 | 2,283 | 125 | 11,900 | 14,875 |
| GUILFORD | 2,776 | 248,095 | 310,196 | 1,585 | 150,892 | 188,615 |
| HALIFAX | 5,269 | 116,606 | 147,589 | 1,235 | 38,695 | 48,744 |
| HARNETT | 650 | 61,880 | 77,350 | | | |
| HAYWOOD | 4,788 | 237,064 | 297,371 | 2,195 | 149,149 | 186,620 |
| HENDERSON | 3,765 | 353,170 | 441,487 | 1,050 | 99,960 | 124,950 |
| HOKE | 437 | 10,294 | 13,017 | | | |
| IREDELL | 19,577 | 1,674,839 | 2,094,404 | 24,962 | 2,089,094 | 2,611,368 |
| JACKSON | 95 | 9,044 | 11,305 | | | |
| JOHNSTON | 170 | 10,521 | 13,178 | | | |
| LENOIR | 580 | 55,216 | 69,020 | | | |
| LINCOLN | 3,860 | 350,251 | 437,853 | 4,595 | 330,621 | 413,513 |
| MACON | 315 | 29,988 | 37,485 | | | |
| MADISON | 911 | 25,162 | 31,746 | | | |
| MARTIN | 825 | 64,383 | 80,546 | | | |
| MCDOWELL | 405 | 38,556 | 48,195 | 200 | 19,040 | 23,800 |
| MECKLENBURG | 2,216 | 138,477 | 173,441 | 0 | 0 | 0 |
| MONTGOMERY | 586 | 55,787 | 69,734 | | | |
| MOORE | 1,265 | 18,090 | 23,099 | | | |
| NASH | 1,107 | 27,965 | 35,325 | 0 | 0 | 0 |

| County | 2006 Cattle Number of Head | 2006 PAN (lb) | 2006 P ₂ O ₅ (lb) | 2015 Cattle Number of Head | 2015 PAN (lb) | 2015 P ₂ O ₅ (lb) |
|---------------------|----------------------------------|---------------------|---|----------------------------------|---------------------|---|
| NORTHAMPTON | 591 | 8,451 | 10,792 | | | |
| ONSWLOW | 100 | 9,520 | 11,900 | | | |
| ORANGE | 5,658 | 400,303 | 501,037 | 960 | 91,392 | 114,240 |
| PAMLICO | 60 | 858 | 1,096 | | | |
| PENDER | 500 | 7,150 | 9,130 | | | |
| PERSON | 400 | 38,080 | 47,600 | 200 | 19,040 | 23,800 |
| PITT | 1,860 | 26,598 | 33,964 | | | |
| POLK | 1,095 | 31,434 | 39,639 | | | |
| RANDOLPH | 8,343 | 714,567 | 893,588 | 12,274 | 1,000,756 | 1,251,325 |
| RICHMOND | 160 | 2,288 | 2,922 | | | |
| ROBESON | 230 | 3,289 | 4,200 | | | |
| ROCKINGHAM | 1,628 | 118,662 | 148,500 | 454 | 43,221 | 54,026 |
| ROWAN | 5,318 | 483,249 | 604,157 | 2,470 | 229,499 | 286,874 |
| RUTHERFORD | 665 | 63,308 | 79,135 | | | |
| SAMPSON | 1,250 | 119,000 | 148,750 | 1,808 | 172,122 | 215,152 |
| STANLY | 2,008 | 191,162 | 238,952 | 418 | 39,794 | 49,742 |
| STOKES | 2,973 | 72,042 | 91,057 | 590 | 29,876 | 37,470 |
| SURRY | 3,100 | 185,905 | 232,901 | 1,050 | 68,845 | 86,191 |
| SWAIN | 249 | 15,696 | 19,658 | | | |
| TRANSYLVANIA | 380 | 5,434 | 6,939 | | | |
| UNION | 1,439 | 136,993 | 171,241 | | | |
| VANCE | 60 | 5,712 | 7,140 | | | |
| WAKE | 985 | 72,900 | 91,224 | 192 | 18,278 | 22,848 |
| WARREN | 2,190 | 83,093 | 104,463 | 0 | 0 | 0 |
| WASHINGTON | 120 | 1,716 | 2,191 | 120 | 1,716 | 2,191 |
| WATAUGA | 6 | 86 | 110 | | | |
| WAYNE | 300 | 17,234 | 21,596 | 160 | 15,232 | 19,040 |
| WILKES | 7,482 | 402,179 | 504,186 | 3,576 | 168,579 | 211,344 |
| YADKIN | 4,149 | 347,550 | 434,541 | 2,585 | 191,733 | 239,787 |

**Department of Environmental Quality
Annual Report on Animal Waste Operations
Permitting, Inspection and Compliance Activities
July 1, 2016 through June 30, 2017**

Per G.S. 143-215.10M, the Department of Environmental Quality reports annually to the Environmental Review Commission and Fiscal Research Division on the permitting, inspection, and compliance activity of animal waste operations across the state. Accounting for activities required under G.S. 143-215.10F and S.L. 1997-443 (and its subsequent amendments) is also included in this report.

General Statute 143-215.10F requires annual inspection of every permitted animal operation by the N.C. Division of Water Resources (DWR). Under S.L. 1997-443, the Division of Soil and Water Conservation (DSWC) (effective July 1, 2011, DSWC is a division under the Department of Agriculture and Consumer Services) conducts a pilot project inspecting swine operations in Brunswick, Columbus, Jones and Pender counties. DWR conducts all routine animal operation inspections except for those facilities located in the above-mentioned pilot counties. In addition to performing compliance inspections under S.L. 1997-443, DSWC provides technical assistance and operation review inspections statewide upon request.

The tables below indicate the number of inspections performed by the DWR and the DSWC, the number of violations identified during inspections, enforcement actions initiated, and permits issued from July 1, 2016 through June 30, 2017.

Overall, the two divisions conducted 2,459 compliance inspections and operation reviews during the 2016-2017 fiscal year throughout the seven regional offices (Table 1). Regional office abbreviations are explained at the end of this document. Each facility received at least one compliance inspection by DWR, or by DSWC in pilot counties.

Table 1. Inspection activities of DWR and DSWC staff during the 2016-2017 fiscal year.

| INSPECTIONS | ARO | FRO | MRO | RRO | WARO | WIRO | WSRO | State Totals |
|---|-----------|------------|-----------|------------|------------|------------|------------|--------------|
| DWR Total number of inspections completed | 31 | 773 | 70 | 229 | 459 | 578 | 114 | 2254 |
| Routine DWR annual compliance inspections | 23 | 746 | 68 | 216 | 424 | 561 | 98 | 2136 |
| Inspections conducted due to complaints | 3 | 10 | 1 | 2 | 0 | 9 | 9 | 34 |
| Follow-up of previous review or inspection | 3 | 15 | 0 | 2 | 14 | 5 | 6 | 45 |
| Emergency Notification | 0 | 0 | 1 | 0 | 12 | 1 | 0 | 14 |
| Lagoon Evaluations | 0 | 2 | 0 | 6 | 5 | 1 | 0 | 14 |
| Other inspections | 2 | 0 | 0 | 3 | 4 | 1 | 1 | 11 |
| DSWC Total number of compliance inspections completed* | | | | | 44 | 126 | | 170 |
| Routine DSWC annual compliance inspections | | | | | 42 | 122 | | 164 |
| Inspections conducted due to complaints | | | | | 1 | 4 | | 5 |
| Follow-up of previous review or inspection | | | | | 1 | 0 | | 1 |
| Emergency Notification | | | | | 0 | 0 | | 0 |
| Response to DWR referral | | | | | 0 | 0 | | 0 |
| Other inspections | | | | | 0 | 0 | | 0 |
| DSWC Total number of operation reviews completed | 0 | 0 | 0 | 0 | 9 | 26 | 0 | 35 |
| Routine operation reviews | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 3 |
| Technical Assistance | 0 | 0 | 0 | 0 | 4 | 13 | 0 | 17 |
| Follow-up of previous review or inspection | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Emergency Notification | 0 | 0 | 0 | 0 | 0 | 9 | 0 | 9 |
| Other inspections | 0 | 0 | 0 | 0 | 5 | 1 | 0 | 6 |
| Totals | 31 | 773 | 70 | 229 | 512 | 730 | 114 | 2459 |
| Total number of Permitted Animal Facilities | 20 | 735 | 70 | 211 | 508 | 668 | 93 | 2305 |

*Pilot Project, S.L. 1997-443 and subsequent amendments.

Table 2 presents the total number of animal permits issued by DWR by regional office in FY 2016-17. This number includes new projects, as well as, any modifications made to existing permits including renewals. Approximately 2,300 farms are covered under State General Permits, which are renewed on a five-year cycle.

Table 2. Permits issued by DWR for animal operations in each Regional Office during July 1, 2016 through June 30, 2017*.

| ANIMAL OPERATIONS PERMITS ISSUED | | ARO | FRO | MRO | RRO | WARO | WIRO | WSRO | State Totals |
|----------------------------------|--|----------|-----------|----------|-----------|-----------|-----------|----------|--------------|
| Swine | | 0 | 40 | 1 | 4 | 26 | 35 | 1 | 107 |
| Cattle | | 0 | 0 | 2 | 2 | 0 | 0 | 3 | 7 |
| Poultry | | 0 | 0 | 0 | 3 | 0 | 0 | 0 | 3 |
| Horses | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Manure Hauler | | 0 | 0 | 0 | 1 | 0 | 4 | 0 | 5 |
| Totals | | 0 | 40 | 3 | 10 | 26 | 39 | 4 | 122 |

* Includes modifications, renewals, and new projects

Tables 3 and 5 provide a summary by regional office of numbers and types of deficiencies and violations found during DWR and DSWC inspections over the past fiscal year. Some of these violations were self-reported and were included in the table to provide a complete picture of the number of deficiency or violation letters issued.

Table 3. Deficiencies and violations found during DWR and DSWC inspections during the past fiscal year by each Regional Office.

| DEFICIENCIES AND VIOLATIONS IDENTIFIED | ARO | FRO | MRO | RRO | WARO | WIRO | WSRO | State Totals |
|---|-----|-----|-----|-----|------|------|------|--------------|
| Deficiencies and Violations found during DSWC operations reviews and DWR inspections* | 8 | 26 | 18 | 6 | 38 | 28 | 32 | 156 |
| Number of facilities receiving notice deficiency** | 6 | 56 | 12 | 18 | 26 | 69 | 13 | 200 |
| Number of facilities receiving notice violation** | 14 | 14 | 4 | 13 | 39 | 18 | 6 | 108 |
| Enforcement actions initiated for violations noted during this year*** | 1 | 12 | 0 | 5 | 7 | 3 | 1 | 29 |

*Violation totals include violations noted during both operation reviews and compliance inspections and may include multiple violations at a single facility.

**Some violation letters were sent due to violations that were self-reported, and not discovered during an inspection. Deficiencies and violations also includes failure to pay annual fees.

***Some enforcement actions being developed by the regional staff are normally not shown as actions initiated during that year. These actions will be included in the next annual report.

Out of the 2459 inspections, approximately six percent of the inspections identified violations (Table 4). Note that each inspection reviews seven major items and with 2459 inspections, there is the potential for a total of 17,213 major violations. There were 156 violations identified (less than one percent of the universe of potential violations). Inadequate freeboard, unpermitted discharges from the systems, and evidence of over application were the most common violations and deficiencies (Tables 4 – 6). The high number of freeboard violation is mainly attributed to Hurricane Matthew. Cattle and Swine facilities had the highest number of violations and deficiencies among the types of animal operations (Table 6).

Table 4. A breakdown of specific violations discovered during DWR and DSWC inspections during the past fiscal year.

| DEFICIENCIES AND VIOLATIONS IDENTIFIED | | Total number of inspections with identified problem | Percent of total problems identified | Percent of total inspections completed (2559) |
|---|--|---|--------------------------------------|---|
| Discharges from Animal Waste Management System | | 21 | 13.5% | 0.9% |
| Of the total discharges identified, the number of discharges that reached surface waters of the state | | (15) | (9.6%) | (0.6%) |
| Inadequate Freeboard (Permitted Farms) | | 48 | 30.8% | 2.0% |
| Of the total inspections identified with inadequate freeboard, the number of inspections with freeboard noted at less than 1 foot | | (6) | (3.8%) | (0.2%) |
| No Certified Operator in Charge | | 0 | 0.0% | 0.0% |
| Evidence of over application | | 47 | 30.1% | 1.9% |
| Does not meet setbacks | | 5 | 3.2% | 0.2% |
| Inadequate land | | 5 | 3.2% | 0.2% |
| Crop differs from that stated in Certified Animal Waste Management Plan | | 30 | 19.2% | 1.2% |
| Totals* | | 156 | 100.0% | 6.3% |

Table 5. Deficiencies and violations discovered during DWR and DSWC inspections by Regional Office over the past fiscal year.

| DEFICIENCIES AND VIOLATIONS IDENTIFIED | | ARO | FRO | MRO | RRO | WARO | WIRO | WSRO | State Totals |
|---|--|----------|-----------|-----------|----------|-----------|-----------|-----------|--------------|
| Discharges from Animal Waste Management System | | 6 | 7 | 1 | 2 | 2 | 0 | 3 | 21 |
| Of the total discharges identified, the number of discharges that reached surface waters of the state | | (5) | (4) | (1) | (2) | (0) | (0) | (3) | (15) |
| Inadequate Freeboard (Permitted Farms) | | 0 | 10 | 0 | 1 | 19 | 15 | 3 | 48 |
| Of the total inspections identified with inadequate freeboard, the number of inspections with freeboard noted at less than 1 foot | | (0) | (0) | (0) | (0) | (4) | (1) | (1) | (6) |
| No Certified Operator in Charge | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Evidence of over application | | 1 | 7 | 0 | 1 | 16 | 11 | 11 | 47 |
| Does not meet setbacks | | 0 | 0 | 0 | 1 | 0 | 2 | 2 | 5 |
| Inadequate land | | 0 | 1 | 0 | 0 | 0 | 0 | 4 | 5 |
| Crop differs from that stated in Certified Animal Waste Management Plan | | 1 | 1 | 17 | 1 | 0 | 0 | 9 | 30 |
| Totals | | 8 | 26 | 18 | 6 | 38 | 28 | 32 | 156 |

Table 6. Deficiencies and violations found during inspection by DWR and DSWC at each type of animal operation over the past fiscal year.

| DEFICIENCIES AND VIOLATIONS IDENTIFIED | Swine | Cattle | Poultry | Horses | State Totals |
|---|--------------|---------------|----------------|---------------|---------------------|
| Discharges from Animal Waste Management System | 11 | 10 | 0 | 0 | 21 |
| Of the total discharges identified, the number of discharges that reached surface waters of the state | (5) | (9) | (1) | (0) | (15) |
| Inadequate Freeboard (Permitted Farms) | 46 | 2 | 0 | 0 | 48 |
| Of the total inspections identified with inadequate freeboard, the number of inspections with freeboard noted at less than 1 foot | (5) | (1) | (0) | (0) | (6) |
| No Certified Operator in Charge | 0 | 0 | 0 | 0 | 0 |
| Evidence of over application | 36 | 11 | 0 | 0 | 47 |
| Does not meet setbacks | 3 | 2 | 0 | 0 | 5 |
| Inadequate land | 1 | 4 | 0 | 0 | 5 |
| Crop differs from that stated in Certified Animal Waste Management Plan | 4 | 26 | 0 | 0 | 30 |
| Totals | 101 | 55 | 0 | 0 | 156 |
| Total Number of Animal Operations | 2098 | 183 | 20 | 4 | 2305 |

Regional Office Abbreviations:

- ARO – Asheville Regional Office
- FRO – Fayetteville Regional Office
- MRO – Mooresville Regional Office
- RRO – Raleigh Regional Office
- WARO – Washington Regional Office
- WIRO – Wilmington Regional Office
- WSRO – Winston-Salem Regional Office