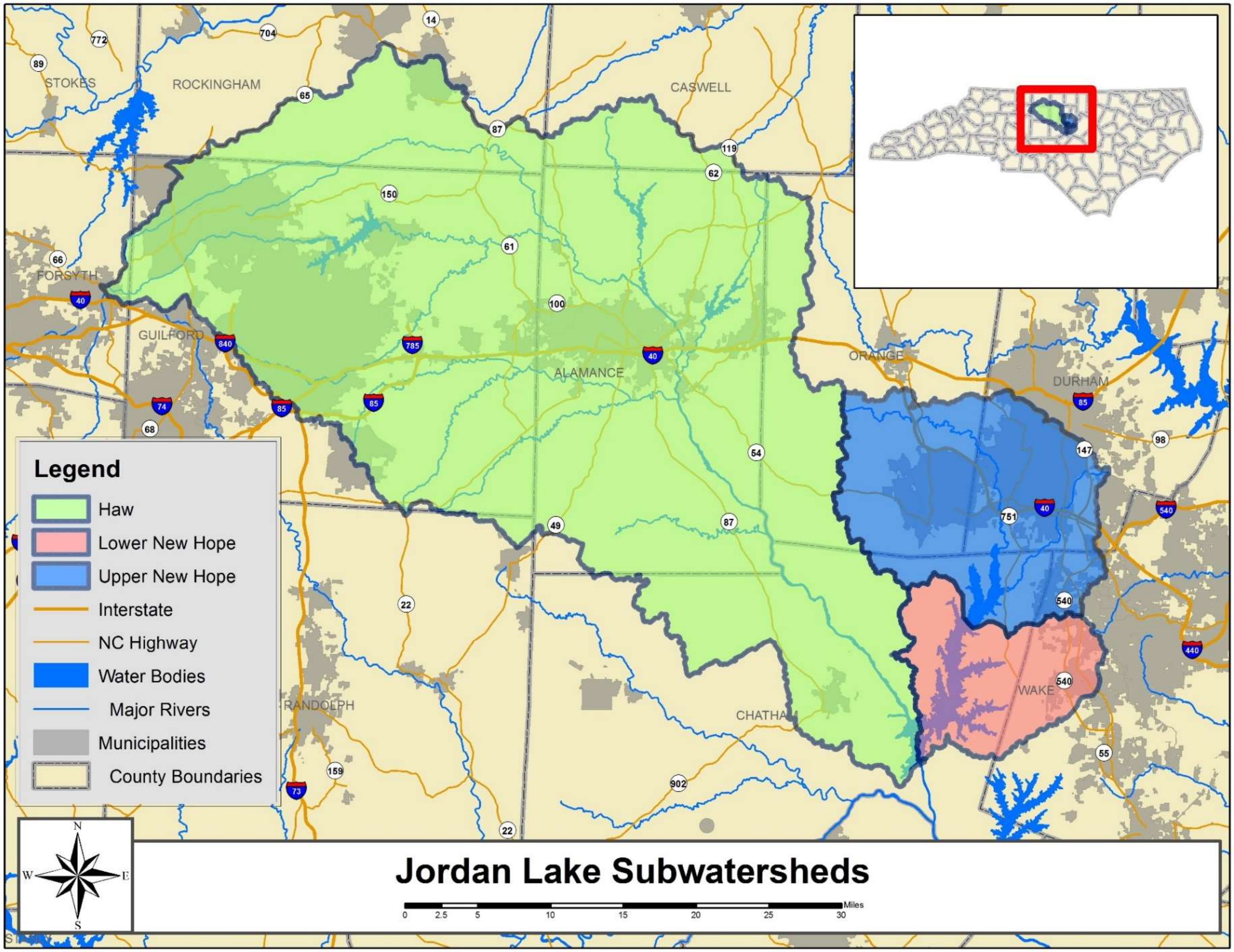
NCDA&CS

2024 Annual Progress Report for the Jordan Lake Agriculture Rule (15A NCAC 02B.0264) for the Baseline Period (1997-2001) for Crop Year 2022

A Report to the Division of Water Resources from the Jordan Lake Watershed Oversight Committee: Crop Year 2022

Date approved by Jordan Lake Watershed Oversight Committee: 2/14/2024
Date submitted to NC Division of Water Resources: 2/19/2024

Contents



Jordan Lake Subwatersheds
Legend
Haw
Lower New Hope
Upper New Hope
Interstate
NC Highway
Water Bodies
Major Rivers
Municipalities
County Boundaries
STOKES
ROCKINGHAM
CASWELL
FORSYTH
GUILFORD
ALAMANCE
ORANGE
DURHAM
RANDOLPH
CHATHAM
WAKE
Miles
0
2.5
5
10
15
20
25
30
N
S
E
W

Summary

This report provides an assessment of collective progress made by the agricultural community in the Jordan Lake watershed to reduce nutrient losses toward compliance with the Jordan Lake Agriculture Rule. In this report the Jordan Lake Watershed Oversight Committee (WOC), to the extent possible given current agriculture data availability, has implemented the accounting methods approved by the Environmental Management Commission's Water Quality Committee in July 2011. These accounting methods estimate changes in nitrogen loss and the phosphorus loss trends in the three Jordan Lake subwatersheds (Haw, Upper New Hope, and Lower New Hope) for the period between the strategy baseline (1997-2001) and the most recent crop years (CY)[1] for which data is available. This report provides progress updates in three categories: cropland nitrogen, pasture nitrogen, and agricultural phosphorus. To produce this report, Division of Soil and Water Conservation staff received, processed and compiled most recently available data from agricultural staff in eight counties, and the WOC reviewed and approved this report. Refer to the map on page three for the location of the Jordan Lake watershed, including the three subwatersheds affected by this rule.

The cropland nitrogen portion of the report demonstrates agriculture's collective compliance with the Jordan Agriculture Rule and estimates progress made by agriculture in the watershed to decrease the amount of nitrogen lost from agricultural management units. Agriculture has been successfully decreasing cropland nutrient losses in each of the Jordan Lake subwatersheds through a variety of methods, especially crop shifts and reduction in nitrogen application rates for most major crops.

In previous reports, cropland nitrogen reduction percentages since strategy baseline (1997-2001) were estimated for each subwatershed. However, as of 2019, the National Agricultural Statistics Service (NASS) of the U.S. Department of Agriculture (USDA) has discontinued annual county crop acreage estimates for hay and tobacco. This is a significant issue for estimating cropland nitrogen reduction because hay constitutes the largest acreage crop grown in all three Jordan Lake subwatersheds. Assuming hay and tobacco acreage has remained at the same levels since 2018 may misrepresent total cropland acres in production in CY2022 and in turn impact the annual nitrogen reduction estimates from baseline achieved by the agriculture community in each Jordan Lake subwatershed. Given this significant shift in data availability, the Jordan Lake Watershed Oversight Committee has adjusted annual reporting methodology as detailed in the "Scope of Report and Methodology" section beginning on page six. More methodology adjustments are expected in the following years as the Jordan Water Supply Nutrient Strategy undergoes re-adoption. As of CY2018, the last year annual NASS crop data was available for all reported commodities (corn, hay, soybeans, tobacco, and wheat), agriculture collectively met cropland nitrogen loss reduction goals for each of the three Jordan Lake subwatersheds, achieving a 33% reduction in the Haw, a 57% reduction in the Upper New Hope, and a 78% reduction in the Lower New Hope. Collective CY2022 agricultural nitrogen reduction from cropland in each Jordan Lake subwatershed has likely not fluctuated significantly from the

Jordan Lake Watershed Oversight Committee Composition, Jordan Agriculture Rule:

1. NC Division of Soil & Water Conservation
2. USDA-NRCS
3. NCDA&CS
4. NC Cooperative Extension Service
5. NC Division of Water Resources
6. Watershed Environmental Interest
7. Watershed Environmental Interest
8. Environmental Interest
9. General Farming Interest
10. Pasture-based Livestock Interest
11. Equine Livestock Interest
12. Cropland Farming Interest
13. Scientific Community

[1] The focus of this report is on the 2022 Crop Year (CY), which began October 1, 2021 and ended September 30, 2022.

estimates reported in CY2018. Review of available CY2022 fertilization rate, crop, and Best Management Practice (BMP) data has found no activity shifts that could indicate a substantial drop in agriculture's collective nitrogen reduction from cropland from CY2018 estimates.

Pasture nitrogen loss estimated in this annual report is based on the total number of pasture acres, pastured livestock, and implemented livestock exclusion systems in the watershed. Reported pasture acreage and livestock totals are collected every 5 years from the USDA Census of Agriculture, and implementation data for exclusion systems is collected from local Soil and Water Conservation District staffs in the watershed. Each of the three subwatersheds met their pastureland nitrogen loss reduction goal from baseline to CY2017, with the Upper New Hope subwatershed reporting a 54% reduction, the Lower New Hope subwatershed reporting a 73% reduction, and the Haw River subwatershed reporting a 49% reduction.

Most qualitative phosphorus indicators demonstrate that there is no increased risk of phosphorus loss from agricultural land in the watershed. Primary factors contributing to this trend include a decrease in the amount of animal waste phosphorus, and wide adoption and implementation of conservation tillage on 90% of cropland in the watershed since baseline.

Jordan Water Supply Nutrient Strategy:
The Environmental Management Commission (EMC) adopted the Jordan Water Supply Nutrient Strategy in 2008. The strategy goal is to reduce the average annual load of nitrogen and phosphorus from each of its subwatersheds to Jordan Lake from baseline levels (1997-2001). In addition to point source rules, mandatory controls were applied to addressing non-point source pollution in agriculture, nutrient management, riparian buffer protection, and urban stormwater. The management strategy built upon efforts in the the Neuse and Tar-Pamlico River Basins.

Rule Requirements and Compliance

Effective August 2009, the Agriculture Rule that is part of the Jordan Water Supply Nutrient Strategy provides for a collective strategy for farmers to meet nitrogen loss reduction goals within six to nine years. The goals for this nutrient strategy are specified at the subwatershed level and compared to the 1997-2001 baseline period. The Lower New Hope subwatershed has a goal of no increase in nitrogen or phosphorus loss. The Upper New Hope subwatershed has a goal of 35% nitrogen loss reduction and 5% phosphorus loss reduction. The Haw River subwatershed has a goal of 8% nitrogen loss reduction and 5% phosphorus loss reduction. All reductions are required for both cropland and pastureland, and the two are calculated separately. A Watershed Oversight Committee (WOC) was established to implement the rule and to assist farmers in complying with the rule.

The Jordan Agriculture Rule also stipulated that if the initial accounting done for CY2010 found that a nitrogen goal had not been achieved in a subwatershed, then Local Advisory Committees were to be formed in that subwatershed and farmers were to register their operations with the committees. Based on the success of cropland nitrogen reductions relative to the strategy goals estimated in initial reports, the WOC found that these actions were not required. However, cooperation and communication with agricultural agency staff at all levels (local, state, and federal) is critical for completion of required annual progress reporting. By January 2024, all staff based in or covering all counties impacted by the Jordan Water Supply Nutrient Strategy provided local information and feedback for inclusion in this annual report.

For reasons discussed in greater detail in the "Scope of Report and Methodology" section, cropland nitrogen loss reductions for each subwatershed (Upper New Hope, Lower New Hope, and Haw River) were not estimated for Crop Year 2022. Only general cropping shift trends were delineated for the Jordan Lake watershed in this report based on available acreage data through NASS and the USDA Farm Service Agency (FSA). For the eight counties in the Jordan Lake watershed, reported major crop acreages through NASS and FSA were largely comparable except for hay acreage. Based on review of these datasets, between CY2021 and CY2022, the Jordan Lake watershed likely experienced a decrease in corn, tobacco, and soybean acreage, and an increase in wheat acreage. For the portion of hay production captured in FSA data (approximately a quarter of total hay production estimated by NASS in 2018), trends indicate there was no significant change (increase or decrease) in hay acreage in all eight counties in the Jordan Lake watershed between CY2021 and CY2022. Fertilization rates in CY2022 for major commodity crops in all three subwatersheds largely remained at levels reported in CY2021. The largest fluctuations were with corn and soybean fertilization rates in the Haw and Upper New Hope subwatersheds and soybean and wheat fertilization rates in the Lower New Hope subwatershed.

Each of the three subwatersheds is meeting their pastureland nitrogen loss reductions for CY2017, with the Upper New Hope subwatershed reporting a 54% reduction, the Lower New Hope subwatershed reporting a 73% reduction, and the Haw River subwatershed reporting a 49% reduction. These reductions were achieved primarily by reduced nitrogen application rates and an overall reduction in pasture acres. Pastureland nitrogen loss is calculated on a 5-year cycle based on agriculture census data availability, and CY2017 is the most recent year for which data is available.

Scope of Report and Methodology

Nitrogen reduction estimates provided in this report represent whole-county scale calculations of nitrogen loss from cropland and pastureland agriculture in the watershed using the ‘aggregate’ version of a nutrient accounting tool called the Nitrogen Loss Estimation Worksheet, or NLEW. The NLEW is an accounting tool developed to meet the specifications of the Neuse Agriculture Rule and approved by the Water Quality Committee of the Environmental Management Commission (EMC) for use in the Jordan Lake watershed. The development team included interagency technical representatives of the NC Division of Water Resources (DWR), NC Division of Soil and Water Conservation (DSWC), USDA-NRCS and was led by NC State University Soil Science Department faculty. A qualitative assessment method was developed and approved by the Water Quality Committee of the EMC for phosphorus and is described later in the report.

The NLEW was developed to estimate a baseline nitrogen loading and subsequent percent nitrogen reductions. The NLEW is an “edge-of-management unit” tool which estimates changes in nitrogen loss from cropland and pastureland but does not estimate changes in nitrogen loading to surface waters. The NLEW is designed to capture changes in agricultural nitrogen resulting from fertilizer management, conservation practice implementation, cropping shifts, and loss of agricultural lands. Both inorganic and animal waste sources of fertilizer to cropland and pastureland are accounted for in NLEW.

For NLEW to generate percent nitrogen reductions, crop and pasture acreage data inputted into the tool must be available. Unfortunately, as of 2019, the NASS discontinued annual county acreage estimates for hay and tobacco in the eight counties lying in the Jordan Lake watershed. This presents a significant issue in calculating cropland nitrogen reductions because hay constitutes the largest acreage crop grown in all three Jordan Lake subwatersheds. For the CY2019 and CY2020 annual progress reports, hay and tobacco acreages in each county were estimated to remain at the acreage levels reported in CY2018, due to lack of recent data and not because of supplemental rationale or calculations. However, using a merged dataset consisting of 2018 and current crop year data may misrepresent total cropland acres in production and impact annual nitrogen reduction estimates from baseline achieved by the agriculture community, particularly as the time between 2018 and the current crop year increases. In this report, the Jordan Lake Watershed Oversight

Committee, with concurrence from Division of Water Resources, has not included CY2022 cropland nitrogen reduction estimates as a result of the data availability change. Instead, best management practice implementation and fertilization management updates are provided along with general discussion of cropping trends based on review of available annual crop acreage data from NASS and the FSA. The WOC anticipates cropland nitrogen reduction estimates for Jordan Lake subwatersheds will next be calculated when USDA Census of Agriculture data is released (expected in 2024). More methodology adjustments are expected in the following years, as the Jordan Water Supply Nutrient Strategy undergoes re-adoption.

Despite the recent data availability change, the agriculture community has made significant progress to date in achieving nitrogen loss reduction from baseline for both cropland and pastureland. Figure 1 represents the annual cropland percent nitrogen loss reduction from baseline to 2018, the most recent year with comprehensive crop data. Figure 2 represents the annual pastureland nitrogen loss reduction from 2007 to 2017, the most recent year with comprehensive pasture data.

Figure 1. Collective Cropland Nitrogen Loss Reduction Percent by Jordan Lake subwatershed 2010 to 2018 Based on NLEW

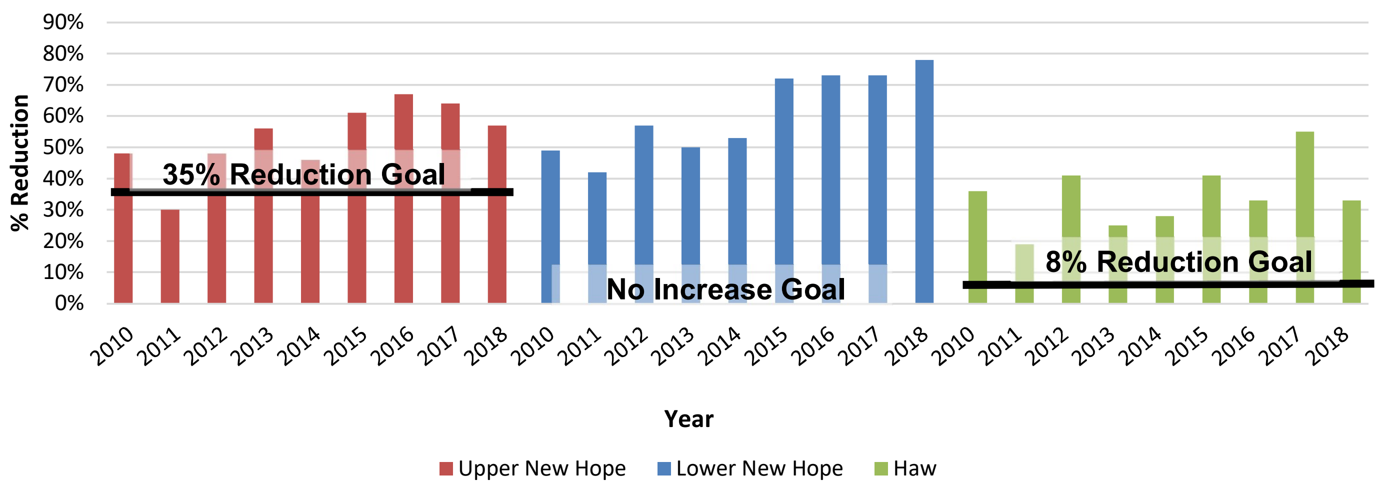
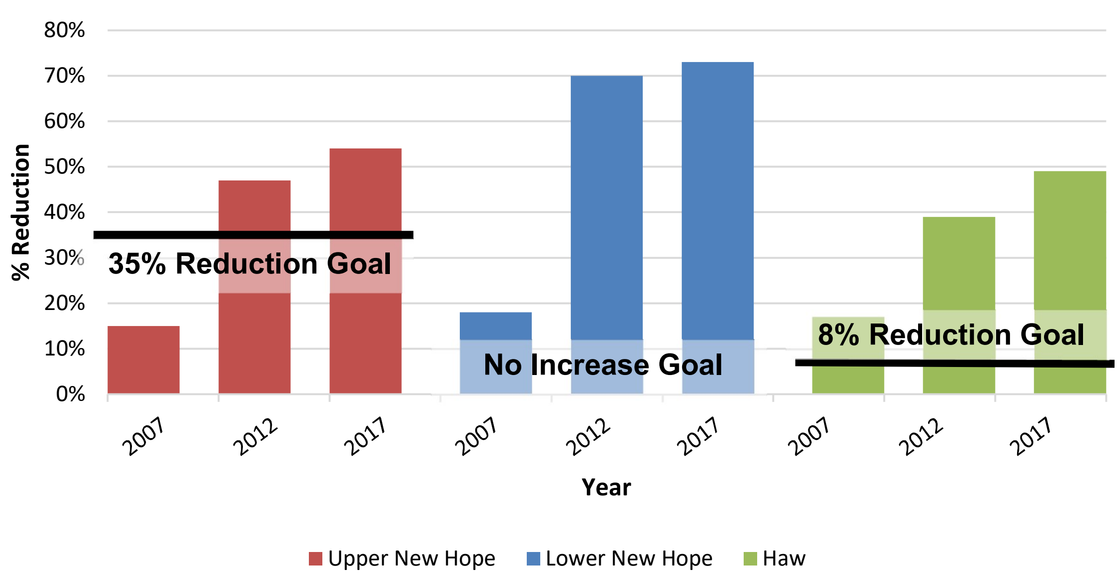


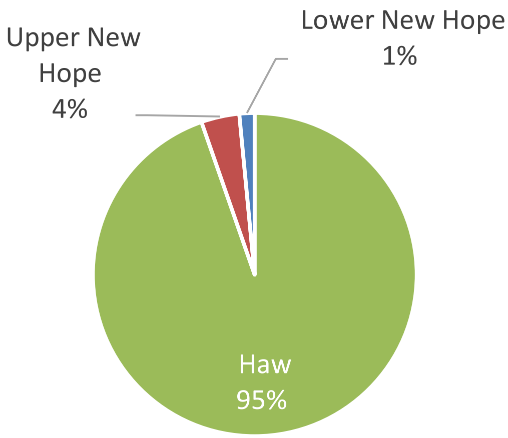
Figure 2. Collective Pastureland Nitrogen Loss Reduction Percent by Jordan Lake subwatershed 2007 to 2017 Based on NLEW



Nitrogen Reduction from Cropland from Baseline for CY2022

The Jordan Lake watershed encompasses just over 1,000,000 acres, of which approximately a tenth is generally planted in cropping systems. The Haw River subwatershed grows 95% of crop acreage, followed by the Upper New Hope (4%), and Lower New Hope (1%). Figure 3 shows a breakdown of typical cropland acres by subwatershed:

Figure 3: Typical cropland acres grown by subwatershed in the Jordan Lake Watershed



Data Changes in CY2022 and Impact on Nitrogen Reduction Estimates from Baseline

Since 2019, the National Agricultural Statistics Service (NASS) of the U.S. Department of Agriculture (USDA) has discontinued annual county acreage estimates for hay and tobacco in the eight counties lying in the Jordan Lake watershed. This is a significant issue because hay constitutes the largest acreage crop grown in all three Jordan Lake subwatersheds. For CY2019 and CY2020, hay and tobacco acreages in each county were estimated to largely remain at the acreage levels reported in 2018. However, using a merged dataset consisting of 2018 and current crop year data may misrepresent total cropland acres in production and impact annual nitrogen reduction estimates from baseline achieved by the agriculture community, particularly as the time between 2018 and the current crop year increases. In this report, the Jordan Lake Watershed Oversight Committee, with support from Division of Water Resources, has not included CY2022 cropland nitrogen reduction estimates as a result of this data availability change. Instead, best management practice implementation and fertilization management updates are provided along with general discussion of cropping trends based on review of available (but incomplete) annual crop acreage data from NASS and the USDA Farm Service Agency. Cropland nitrogen reduction estimates for Jordan Lake subwatersheds will next be calculated when USDA Census of Agriculture data is released (expected in 2024). More methodology adjustments are expected in the following years, as the Jordan Water Supply Nutrient Strategy undergoes re-adoption.

No cropland nitrogen loss (lbs/yr) or cropland nitrogen loss percent reductions from baseline values were calculated through NLEW for CY2022 due to NASS data availability changes. Table 1 lists each county's cropland nitrogen loss (lbs/yr) at baseline and in CY2018, along with estimated nitrogen loss percent reductions from baseline. This data was included to demonstrate progress from baseline in meeting nutrient reduction mandates based on the latest year of comprehensive crop data (2018). Cropland Best Management Practices (BMPs) continued to be implemented in the Jordan Lake watershed in CY2022. Approximately 26 acres of 20-foot buffer, one acre of 30-foot buffer, and twelve acres of 50-foot buffer were implemented in the Haw River subwatershed. The Lower New Hope subwatershed experienced a substantial increase in unfertilized cover crop acreage in CY2022. Fertilization rates for major commodity crops in each of the three subwatersheds largely remained consistent with rates reported in CY2021. The largest fluctuations were with corn and soybean fertilization rates in the Haw and Upper New Hope subwatersheds and soybean and wheat fertilization rates in the Lower New Hope subwatershed. General cropping shift trends were delineated based on available acreage data through NASS and the FSA. Based on review of these datasets, between CY2021 and CY2022, the Jordan Lake watershed likely experienced a decrease in corn, tobacco, and soybean acreage, and an increase in wheat acreage.

Table 1. Estimated reductions in agricultural nitrogen loss (cropland) from baseline (1997-2001), CY2018, Jordan Lake Watershed †

County	Baseline Nitrogen Loss (lb)†	CY2018 Nitrogen Loss (lb)†*	CY2018 N Loss Reduction (%)‡*
Upper New Hope subwatershed: Goal of 35% nitrogen loss reduction (4% of total Jordan Lake Watershed cropland)			
Chatham	43,063	7,996	81%
Durham	37,618	15,565	59%
Orange	68,632	43,039	37%
Wake	9,694	2,175	78%
Total	**159,007**	**68,774**	**57%**
Lower New Hope subwatershed: Goal of no increase in nitrogen loss (1% of total Jordan Lake Watershed cropland)			
Chatham	56,632	11,858	79%
Wake	38,362	8,626	78%
Total	**94,994**	**20,483**	**78%**
Haw subwatershed: Goal of 8% nitrogen loss reduction (95% of total Jordan Lake Watershed cropland)			
Alamance	697,634	458,154	34%
Caswell	260,254	126,569	51%
Chatham	245,458	55,704	77%
Guilford	1,393,551	1,101,023	21%
Orange	231,272	137,983	40%
Rockingham	169,080	127,705	24%
Total	**2,997,249**	**2,007,138**	**33%**

† *Nitrogen loss values are for comparative purposes. These are produced via NLEW calculations and based on best available nitrogen application rates to cropland in the watershed. Loss totals represent nitrogen neither used by crops nor intercepted by BMPs in a Soil Management Group. This is not an in-stream loading value.*
‡ *Total reduction percentages are calculated by comparing current nitrogen loss to baseline nitrogen loss. Individual county totals contribute proportionally, and so smaller watershed trends tend to be more volatile than large watershed trends.*
**Some CY2018 Nitrogen Loss and Reduction values may have changed since originally reported to fix an acreage error.*

Best Management Practice Implementation

Agriculture is credited with different nitrogen reduction efficiencies, expressed as percentages, for riparian buffer practice installation widths ranging from 20 feet to 100 feet. The NLEW for Jordan Lake provides the percent nitrogen reduction efficiencies for buffer practice installation widths on cropland as displayed in Table 2.

Table 2: Nitrogen loss reduction percentages by buffer practice installation width

Buffer width	Nitrogen loss reduction percentage
20 feet	20%
30 feet	25%
50 feet	30%
100 feet	35%

Riparian buffers have many important functions beyond being effective in reducing nitrogen. Research has shown that upwards of 75% of sediment from agricultural sources is from stream banks and that riparian buffers are important for reducing this sediment.[2] In addition, riparian buffers can reduce phosphorus and sediment as it moves through the buffer and provide other critically important functions. According to a report completed in 2007, *Delineating Agriculture in the Lake Jordan River Basin,* most agricultural land in the Jordan Lake watershed is already buffered. This study found that six counties within the watershed had more than 75% of their agricultural land buffered, and that the average buffer width was greater than 50 feet .[3] Due to data availability and staffing limitations, a decision was made to utilize GIS technology and aerial photography for baseline BMP totals. Baseline acreage of riparian buffers on cropland among the different widths for which agriculture receives reductions was obtained through this process first in 1998 and then again in 2010. Overall, total acres of buffers slightly decreased between 1998 and 2010 because of decreased overall agricultural production acres during the same time period. This is also reflected in the reported buffer acres included in the first annual progress report (CY2010), which were noticeably lower than baseline totals. Since the CY2010 report, total buffer acreage has been obtained through individual contracts implemented through state and federal cost share contracts, and buffer acres are added after each project's completion.

Since the baseline, some buffer practices have been installed in the Jordan Lake watershed through the Division of Mitigation Services (DMS). The DMS has completed 64 projects in the watershed from the baseline through 2023, and at least six private mitigation banks from which DMS purchases credits are currently operating in the watershed. The DMS project data is not tracked either for previous land use or for the area of buffer restored in conjunction with stream restoration projects. Because DMS funded buffers for compensatory mitigation for stream or buffer permitted losses also occurring in the watershed, they are not eligible to be counted for reductions under the agriculture rule, even if they are located on agricultural lands. Thus, DMS buffer restoration projects are not included in the totals provided in this report. As DMS continues to install buffers adjacent to and purchase credits generated on agricultural land, this decreases the possibility for buffers to be installed for credit under agriculture rule progress reporting.

---

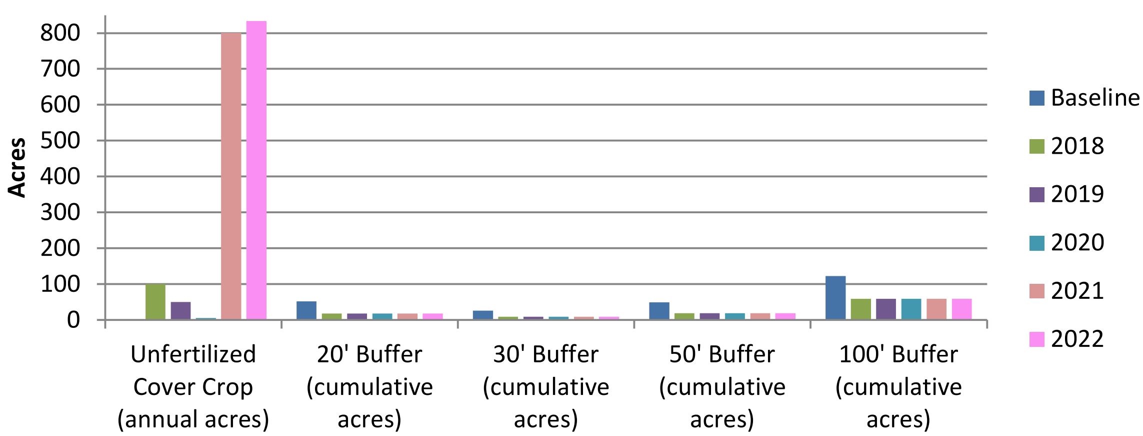
[2] Osmond,D., D. Meals, D. Hoag, and M. Arabi. 2012. How to Build Better Agricultural Conservation Programs to Protect Water Quality: The NIFA-CEAP Experience. Soil and Water Conservation Society, Ankeny, IA.

[3] Osmond, Deanna L. 2007. Final Report for the Sampling Analysis: Delineating Agriculture in the Lake Jordan River Basin. Department of Soil Science, North Carolina State University, Raleigh, NC 27606.

In the Lower New Hope subwatershed, as of 2010, 144 acres (57%) of the buffers in the subwatershed still exist but are no longer eligible for accounting under the agriculture rule because adjacent cropland acres have been taken out of agricultural production. This subwatershed experienced a decrease of 12% of cropland with wide riparian buffers from 1998 to 2010. In the Upper New Hope subwatershed, 531 acres (39%) of baseline buffers still exist but are no longer eligible for accounting under the agriculture rule, also because adjacent cropland acres have been taken out of agricultural production. This subwatershed experienced a decrease of 21% of cropland from 1998 to 2010. For these two watersheds, the limited number of cropland acres greatly increases the effect of any change in agricultural operation land use on overall nitrogen loss reduction percentage. The Haw River subwatershed only saw a decrease of 1% of buffer acres in the watershed from 1998 to 2010. This is to be expected, since the subwatershed did not lose any cropland acres from 1998 to 2010. Detailed information regarding buffer acreages implemented by subwatershed in baseline (1998) and crop years 2018 through 2022 is displayed in Figures 4, 5, and 6. In CY2022, 26 acres of 20-foot buffer, one acre of 30-foot buffer, and twelve acres of 50-foot buffer were implemented in the Haw River subwatershed. The Lower New Hope subwatershed experienced a substantial increase in unfertilized cover crop acreage in CY2022 because of National Fish and Wildlife funding obtained by Wake SWCD which financed additional unfertilized cover crop implementation in the county.

Of the cropland acres in the Jordan Lake Watershed, 1% are in the Lower New Hope subwatershed.

Figure 4. Nitrogen Reducing BMPs installed on Croplands from Baseline (1998) and 2018 through 2022, Lower New Hope subwatershed, Jordan Lake Watershed *

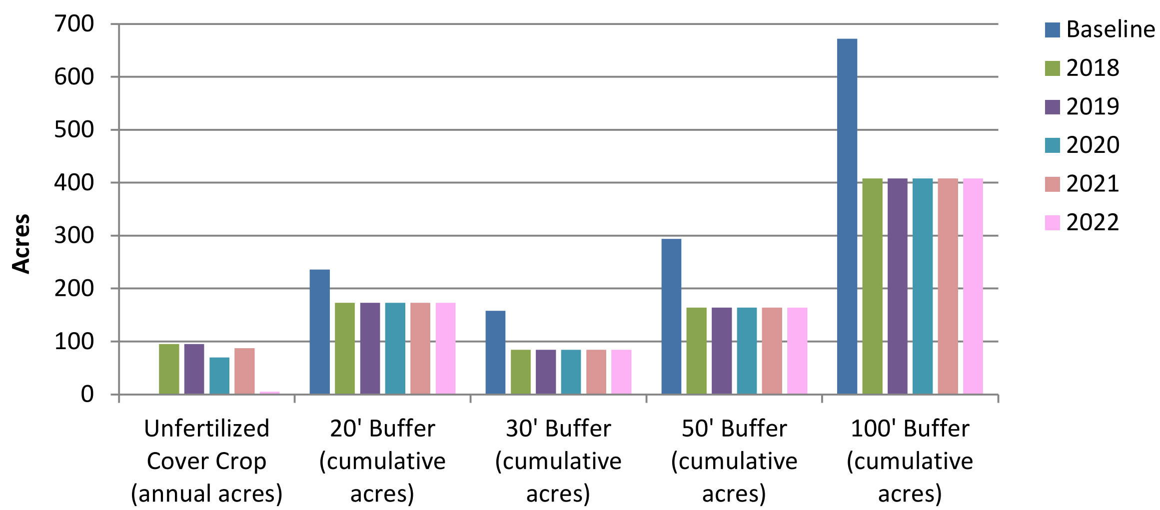


** The acres of buffers listed include estimated acres from GIS analysis from 1998 and 2010 aerial photography and acres implemented through cost share programs since baseline. Cropland acres affected by the buffer could be 5 to 10 times larger than the acreage shown above.*[4]

[4] Bruton, Jeffrey Griffin. 2004. Headwater Catchments: Estimating Surface Drainage Extent Across North Carolina and Correlations Between Landuse, Near Stream, and Water Quality Indicators in the Piedmont Physiographic Region. Ph.D. Dissertation. Department of Forestry and Environmental Resources, North Carolina State University, Raleigh, NC 27606.

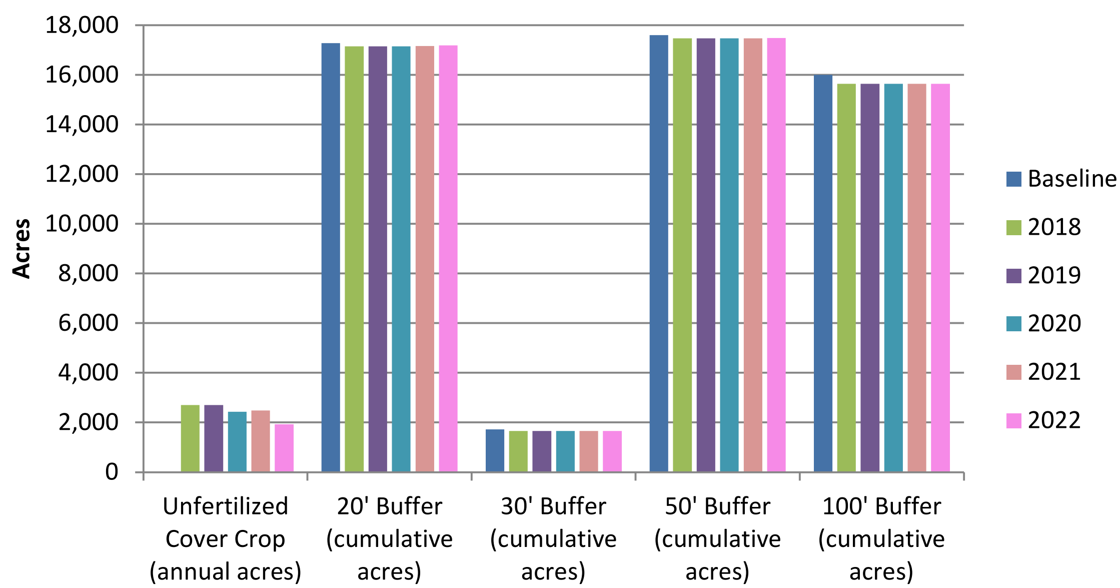
Of the cropland acres in the Jordan Lake Watershed, 4% are in the Upper New Hope subwatershed.

Figure 5. Nitrogen Reducing BMPs installed on Croplands from Baseline (1998) and 2018 through 2022, Upper New Hope subwatershed, Jordan Lake Watershed*



Of the cropland acres in the Jordan Lake Watershed, 95% are in the Haw subwatershed.

Figure 6. Nitrogen Reducing BMPs installed on Croplands from Baseline (1998) and 2018 through 2022, Haw subwatershed, Jordan Lake Watershed*



** The acres of buffers listed include estimated acres from GIS analysis from 1998 and 2010 aerial photography and acres implemented through cost share programs since baseline. Cropland acres affected by the buffer could be 5 to 10 times larger than the acreage shown above.*[5]

[5] Bruton, Jeffrey Griffin. 2004. Headwater Catchments: Estimating Surface Drainage Extent Across North Carolina and Correlations Between Landuse, Near Stream, and Water Quality Indicators in the Piedmont Physiographic Region. Ph.D. Dissertation. Department of Forestry and Environmental Resources, North Carolina State University, Raleigh, NC 27606.

Fertilization Management

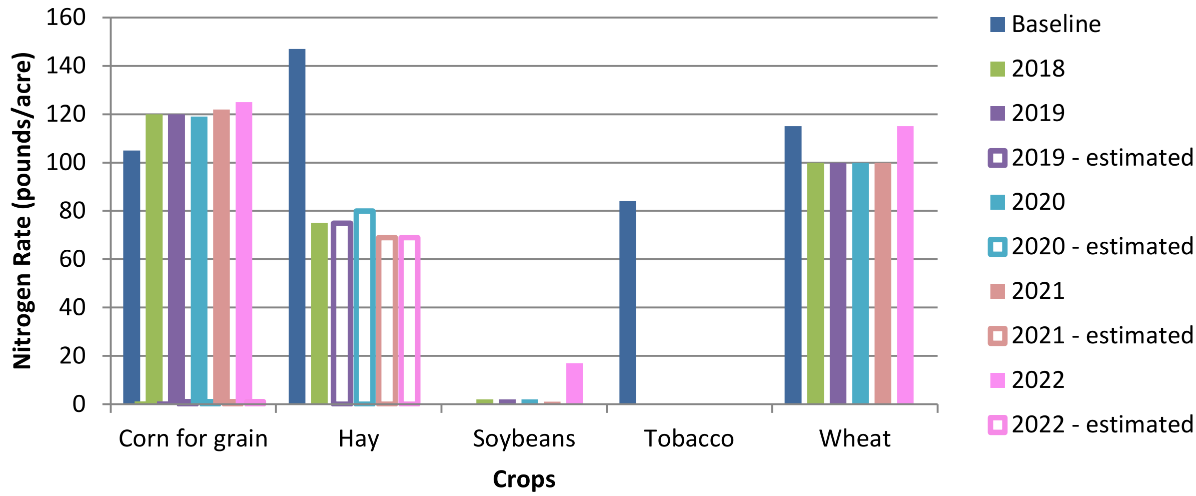
Fertilization rates are revisited annually by counties using data from farmers, commercial applicators and state and federal agencies' professional estimates. Total nitrogen application rates include both organic (waste) and inorganic (commercial fertilizer) sources, even in situations where a producer applies some of both to the same crop. In the Jordan Lake watershed, crops are largely fertilized at recommended agronomic rates or under fertilized to reduce fertilizer costs. Typically, nitrogen application rates for major commodity crops in each Jordan Lake subwatershed are approximated through NLEW by taking a weighted average of fertilization rates based on estimated NASS crop acreage reported for each county. Given data availability changes for NASS hay and tobacco acreage, in CY2022 nitrogen fertilization rates for hay and tobacco were estimated in each Jordan Lake subwatershed by taking the weighted average of fertilization rates by the percentage of county hay and tobacco acreage typically grown in each subwatershed. Using this estimation method, in the Lower New Hope subwatershed, the CY2022 hay fertilization rate was estimated to be 69 lbs N/acre. Hay acreage in the Haw subwatershed was estimated to be fertilized at a rate of 82 lbs N/acre and at 77 lbs N/acre in the Upper New Hope subwatershed. Hay fertilization rates have not fluctuated since CY2021 and since baseline hay acreage has remained largely under fertilized in the Jordan Lake watershed. This has a significant impact on annual cropland nitrogen loss given hay acreage is the dominant crop commodity grown in all three Jordan Lake subwatersheds. CY2022 tobacco fertilization rates in all three subwatersheds also did not fluctuate from CY2021 fertilization rates.

Weighted average nitrogen application rates in CY2022 for other major commodity crops – corn, soybeans, and wheat – were approximated through NLEW based on 2022 NASS county crop acreage data. The largest fluctuations were with corn and soybean fertilization rates in the Haw and Upper New Hope subwatersheds and soybean and wheat fertilization rates in the Lower New Hope subwatershed. The corn fertilization rate in the Haw subwatershed decreased by 11 lbs N/acre, and soybean and wheat rates fluctuated approximately 5 lbs N/acre or less between CY2022 and CY2021. Similarly, in the Upper New Hope subwatershed, the corn fertilization rate decreased by 10 lbs N/acre between CY2021 and CY2022 and the wheat fertilization rate remained largely stable (2 lbs N/acre fluctuation). The soybean fertilization rate in the Upper New Hope subwatershed increased by 11 lbs N/acre in CY2022 from the CY2021 value and in the Lower New Hope subwatershed a similar increase (16 lbs N/acre) was seen in CY2022. The Lower New Hope subwatershed also saw a 15 lbs N/acre increase in the wheat fertilization rate, but corn fertilization rates remained largely stable (3 lbs N/acre fluctuation). Soybean fertilization rates increased in CY2022 because many growers have begun applying nitrogen pre-plant.

Figures 7, 8, and 9 display the nitrogen fertilization rates in pounds per acre (lbs N/acre) for the major crops in the watershed. For many of the high acreage crops in the Jordan Lake watershed, farmers have reduced nitrogen fertilization rates from baseline levels. Corn fertilization rates have increased from baseline levels, although there have been slight decreases in application rates for corn in the Haw subwatershed, which grows approximately 95% of the corn acreage in the Jordan Lake watershed. Soybean fertilization rates in CY2022 have increased from baseline levels in the Lower New Hope and Upper New Hope subwatersheds. The increased fertilization of soybeans in CY2022 may prove to be a short-term trend, however this fertilization rate increase has the potential to impact nitrogen reduction if the trend continues and rates remain high in the next several years. Soybeans are the most widely grown row-crop in each Jordan Lake subwatershed.

Of the cropland acres in the Jordan Lake Watershed, 1% are in the Lower New Hope subwatershed.

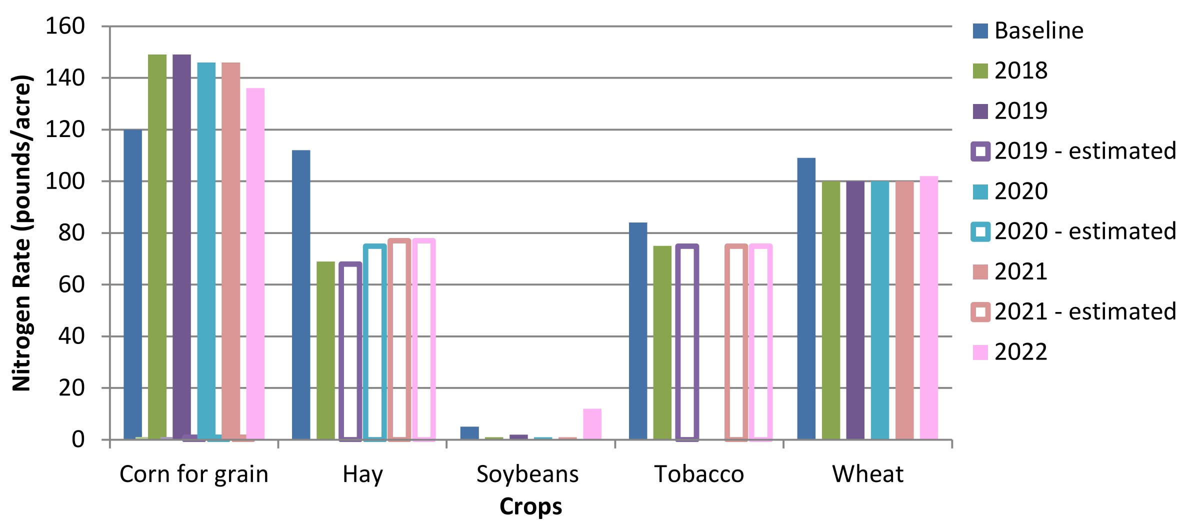
Figure 7. Average annual nitrogen fertilization rate (lb/ac) on cropland for the baseline (1997-2001) and 2018 through 2022, Lower New Hope subwatershed, Jordan Lake Watershed*



**CY2019 and CY2020 fertilization rates for tobacco and hay are graphed as estimated above because CY2018 crop acreage from NASS was used to determine the weighted average fertilization rate for those commodities during those reporting years. The CY2021 and CY2022 fertilization rates above for hay were estimated by taking the weighted average of fertilization rates by the percentage of county hay acreage typically grown in the Lower New Hope subwatershed.*

Of the cropland acres in the Jordan Lake Watershed, 4% are in the Upper New Hope subwatershed.

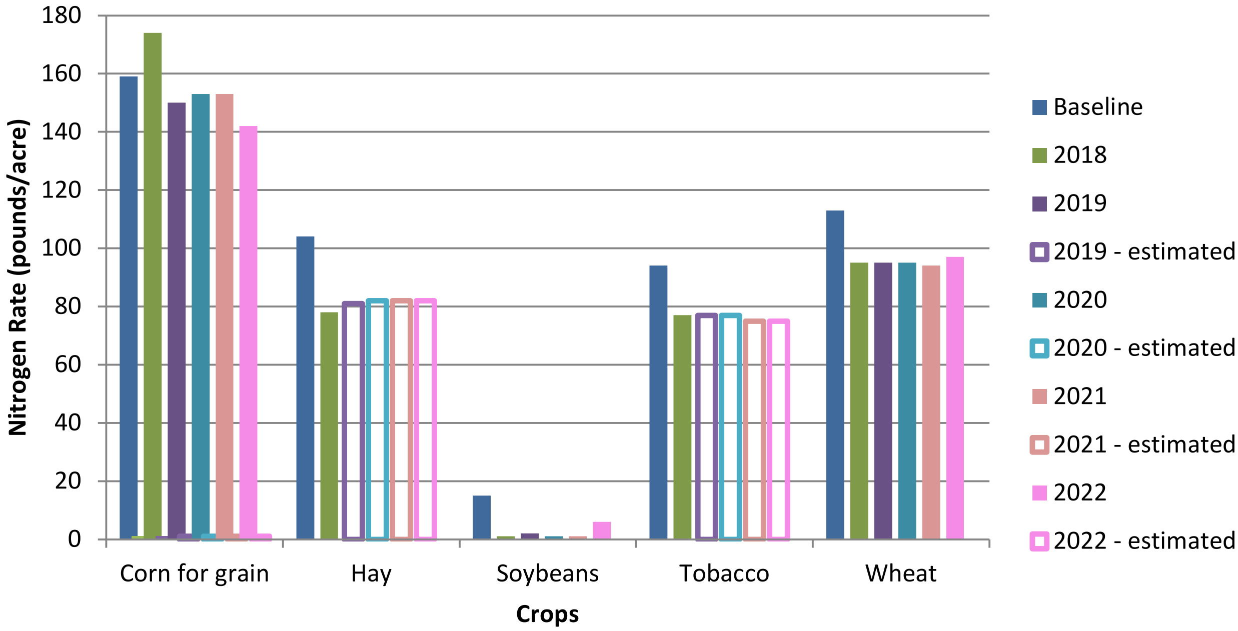
Figure 8. Average annual nitrogen fertilization rate (lb/ac) on cropland for the baseline (1997-2001) and 2018 through 2022, Upper New Hope subwatershed, Jordan Lake Watershed*



**CY2019 - CY2020 fertilization rates for tobacco and hay are graphed as estimated above because CY2018 crop acreage from NASS was used to determine the weighted average fertilization rate for those commodities during those reporting years The CY2021 and CY2022 fertilization rates above for tobacco and hay were estimated by taking the weighted average of fertilization rates by the percentage of county hay and tobacco acreage typically grown in the Upper New Hope subwatershed.*

Of the cropland acres in the Jordan Lake Watershed, 95% are in the Haw subwatershed.

Figure 9. Average annual nitrogen fertilization rate (lb/ac) on cropland for the baseline (1997-2001) and 2018 through 2022, Haw subwatershed, Jordan Lake Watershed*

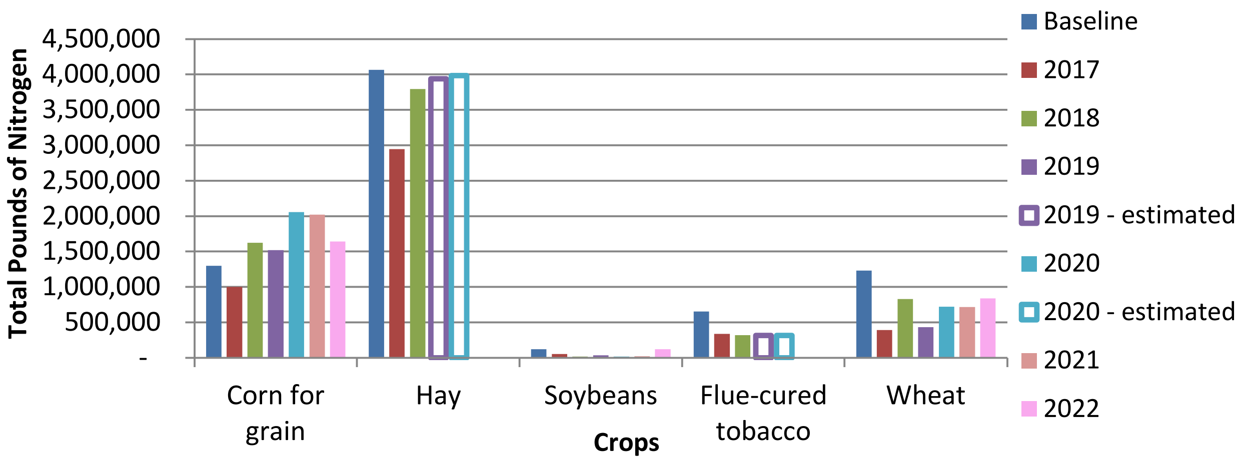


**CY2019 and CY2020 fertilization rates for tobacco and hay are graphed as estimated above because CY2018 crop acreage from NASS was used to determine the weighted average fertilization rate for those commodities during those reporting years. The CY2021 and CY2022 fertilization rates above for tobacco and hay were estimated by taking the weighted average of fertilization rates by the percentage of county hay and tobacco acreage typically grown in the Haw subwatershed.*

Figures 10, 11, and 12 depict the total annual nitrogen (in pounds) applied to cropland during the baseline (1997-2001) and 2017 through 2022 to show the impact of fertilization rates related to crops that are grown in each subwatershed. Due to the small size of the subwatersheds in Jordan Lake, minor changes in nitrogen fertilization rates result in significant effects on the reported nitrogen reductions on cropland for smaller subwatersheds. The total amount of nitrogen lost in each of these subwatersheds is a function of the fertilization rate for each crop and the number of acres planted, which means that the largest nitrogen fluxes in the Jordan Lake watershed occur on hay, wheat, and corn acres in the Haw subwatershed. Total annual nitrogen applied to hay and tobacco in 2022 are not included because of the NASS crop acreage data availability change for those commodities. Of all crops grown in the Jordan Lake watershed, hay acres grown in the Haw subwatershed encompass most of all nitrogen applied to cropland.

Of the cropland acres in the Jordan Lake Watershed, 95% are in the Haw subwatershed.

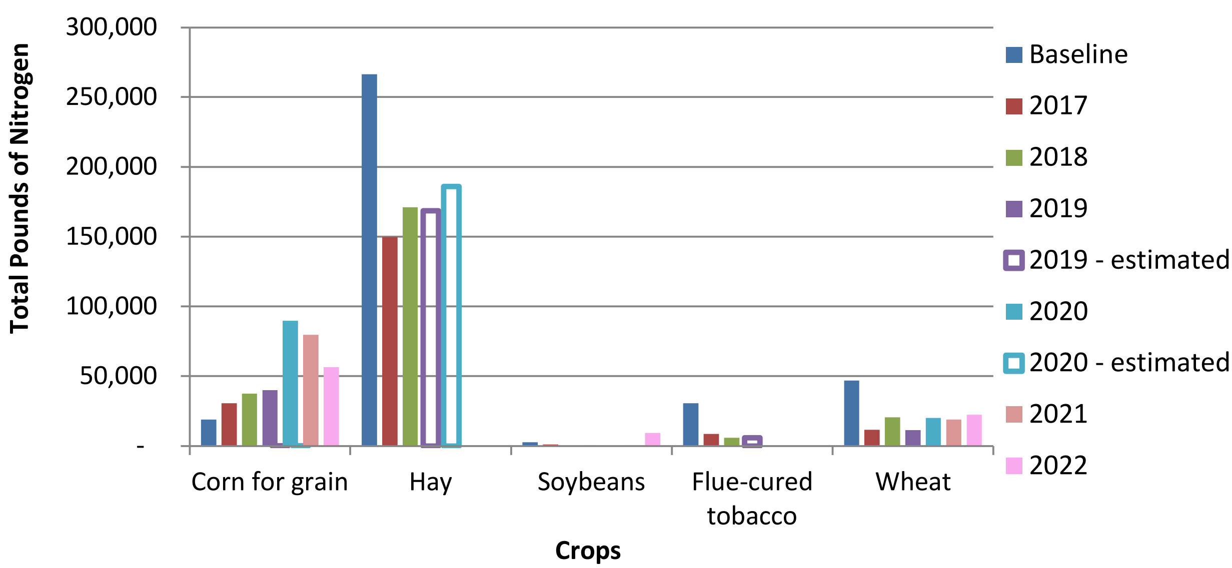
Figure 10. Total annual nitrogen (lbs) applied annually to cropland for the baseline (1997-2001) and 2017 through 2022, Haw subwatershed, Jordan Lake Watershed*



**CY2019 and CY2020 total pounds of nitrogen for tobacco and hay are graphed as estimated because the North Carolina Agriculture Statistics Service (NASS) discontinued reporting annual acreages for those crops in 2019, and total pounds of nitrogen calculated for those commodities uses CY2018 acreage totals.*

Of the cropland acres in the Jordan Lake Watershed, 4% are in the Upper New Hope subwatershed.

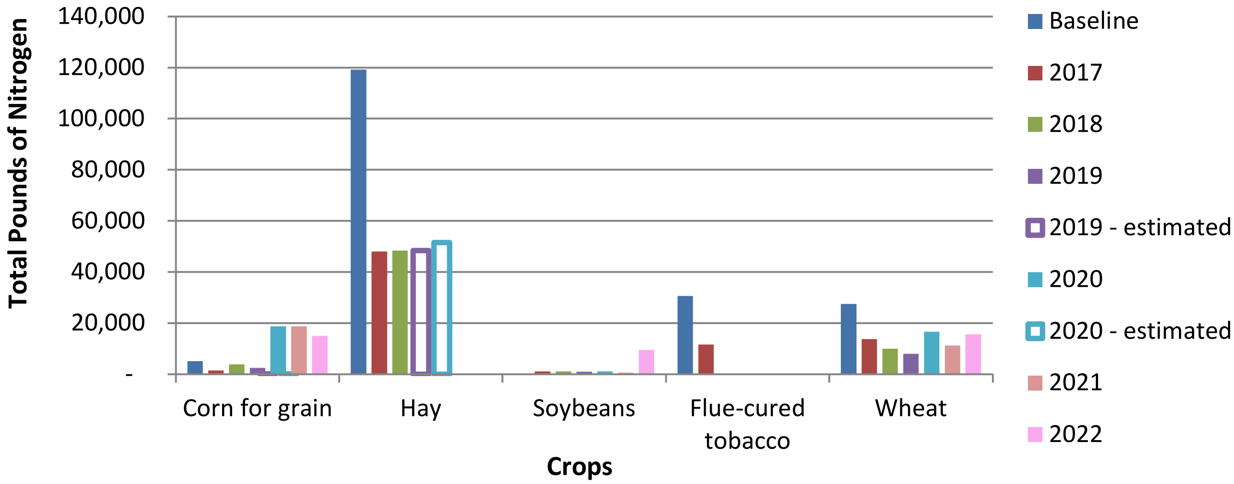
Figure 11. Total annual nitrogen (lbs) applied annually to cropland for the baseline (1997-2001) and 2017 through 2022, Upper New Hope subwatershed, Jordan Lake Watershed*



** CY2019 and CY2020 total pounds of nitrogen for tobacco and hay are graphed as estimated because the North Carolina Agriculture Statistics Service (NASS) discontinued reporting annual acreages for those crops in 2019, and total pounds of nitrogen calculated for those commodities uses CY2018 acreage totals.*

Of the cropland acres in the Jordan Lake Watershed, 1% are in the Lower New Hope subwatershed.

Figure 12. Total annual nitrogen (lbs) applied annually to cropland for the baseline (1997-2001) and 2017 through 2022, Lower New Hope subwatershed, Jordan Lake Watershed*



** CY2019 and CY2020 total pounds of nitrogen for tobacco and hay are graphed as estimated because the North Carolina Agriculture Statistics Service (NASS) discontinued reporting annual acreages for those crops in 2019, and total pounds of nitrogen calculated for those commodities uses CY2018 acreage totals.*

Cropping Shifts

A host of factors from individual choice to global markets determine crop selections. As a result, crop acreages in the Jordan Lake watershed fluctuate annually. Because distinct crops require different amounts of nitrogen and use applied nitrogen with varying efficiency, changes in the mix of crops grown can have a significant impact on the cumulative yearly nitrogen loss reductions in Jordan Lake subwatersheds. For nutrient accounting in baseline and since, North Carolina crop data captured by the NASS in cooperation with the North Carolina Department of Agriculture and Consumer Services (NCDA&CS) has been reported for counties with acreage in Jordan Lake subwatersheds.

The NASS only reports select major commodity crops, which means that smaller acreages of vegetable produce and specialty crops are not included in annual reports. In addition, the NASS does not report planted or harvested acreage for any crop where fewer than 500 acres were grown or where fewer than 3 individual producers reported growing a specific crop. As of 2019, NASS discontinued annual county acreage estimates for two major commodities - hay and tobacco – in the eight counties with crop acreage in the Jordan Lake watershed. This data availability change causes particular challenges with assessing annual cropping shifts in the Jordan Lake watershed because agricultural activity in the watershed is pasture dominated; greater than 60% of agricultural land acreage in the watershed is estimated to be used for pasture or hay production. For this report, given the NASS data availability change, only general cropping shift trends were delineated between CY2021 and CY2022. When 2022 agriculture census data becomes available in 2024, acreage shift estimations for all major commodity crops will be provided.

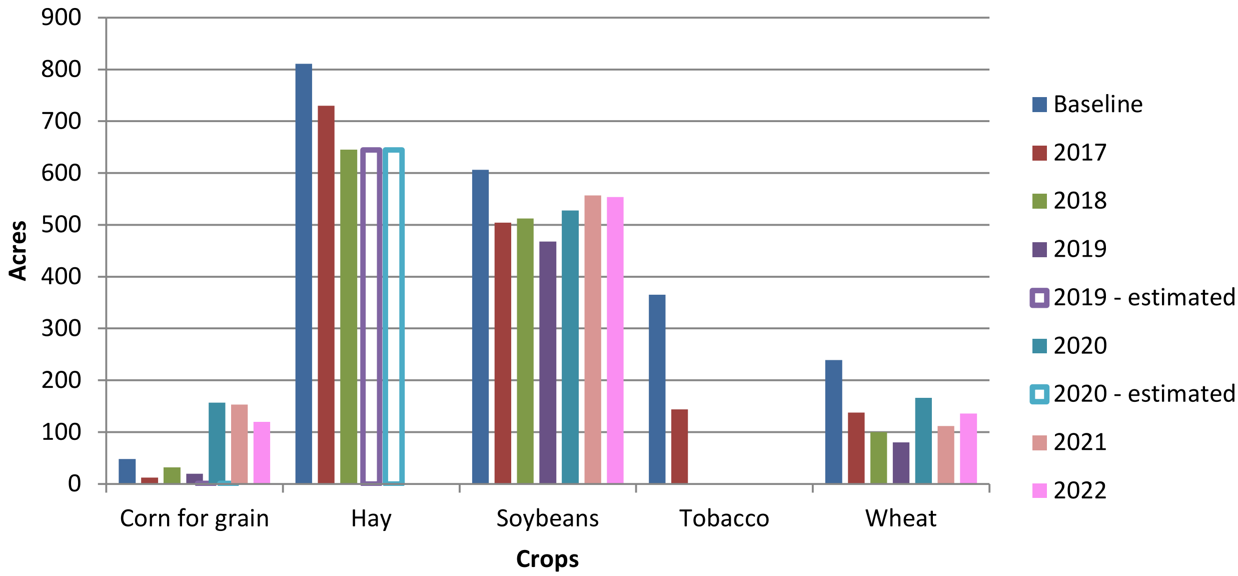
To delineate general cropping shift trends between CY2021 and CY2022, available annual crop data from NASS and annual crop data published by the FSA was consulted and compared. Annual crop data published by the NASS remains the primary cropland acreage data source for nutrient accounting in this watershed as it was used to establish baseline. In 2021 and 2022, major crop acreages in the eight counties in the Jordan Lake watershed were largely comparable between NASS and FSA datasets except for hay acreage totals. Total summed hay acreage reported by the NASS in 2018 for Alamance, Caswell, Chatham, Durham, Guilford, Orange, Rockingham, and Wake was approximately four times the total summed hay acreage FSA published for those eight counties in the same year. As a result, FSA data for hay in the Jordan Lake watershed is limited and only captures a fraction of the hay acreage changes experienced in any given crop year. For the portion of hay production captured in FSA data, there was no significant loss of total reported hay acreage in all 8 counties between CY2021 and CY2022. The FSA reported tobacco acreage is more comparable to tobacco acreage data published by the NASS. In 2018, there was a 30% difference between the NASS and FSA total tobacco acreage in the eight counties assessed. Between CY2021 and CY2022, FSA data indicates a 14% decrease in total tobacco acreage grown in the eight counties with acreage in the Jordan Lake watershed.

For remaining major commodity crops grown in the Jordan Lake watershed – corn, soybeans, and wheat – crop acreage data from both NASS and FSA was available to be examined to identify cropping shift trends. Corn acreage in CY2022 in the eight counties with acreage in Jordan Lake watershed decreased by more than 11% from CY2021 levels in both the NASS and FSA datasets. Soybean acreage decreased by approximately 3% in CY2022 in both datasets. Total wheat acreage increased, although there was a significant difference between the two datasets in the estimated quantity of increase. The NASS data estimates over a 19% increase, whereas FSA data shows a more modest 4% increase in wheat acreage grown in CY2022. This discrepancy is likely due to differences in how these agencies collect and report crop data.

Figures 13, 14, and 15 show the NASS reported crop acres and shifts for the baseline and 2017 through 2022. In these figures hay and tobacco acreages for CY2019 and CY2020 are shown as ‘estimated’ because acreages for those commodities in those reporting years used CY2018 NASS data.

Of the cropland acres in the Jordan Lake Watershed, 1% are in the Lower New Hope subwatershed.

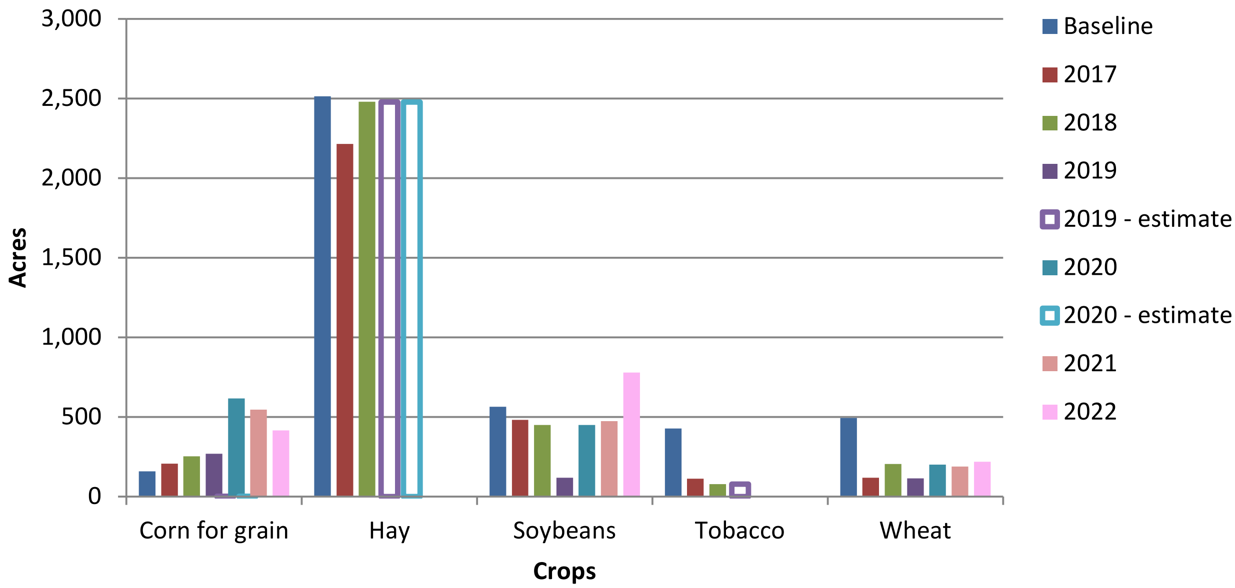
Figure 13. Acreage of Major Crops for the Baseline (1997-2001) and 2017 through 2022, Lower New Hope subwatershed, Jordan Lake Watershed*



**NASS discontinued reporting annual hay acres starting in 2019. The hay acreage graphed as estimated for 2019 and 2020 is the 2018 reported acreage.*

Of the cropland acres in the Jordan Lake Watershed, 4% are in the Upper New Hope subwatershed.

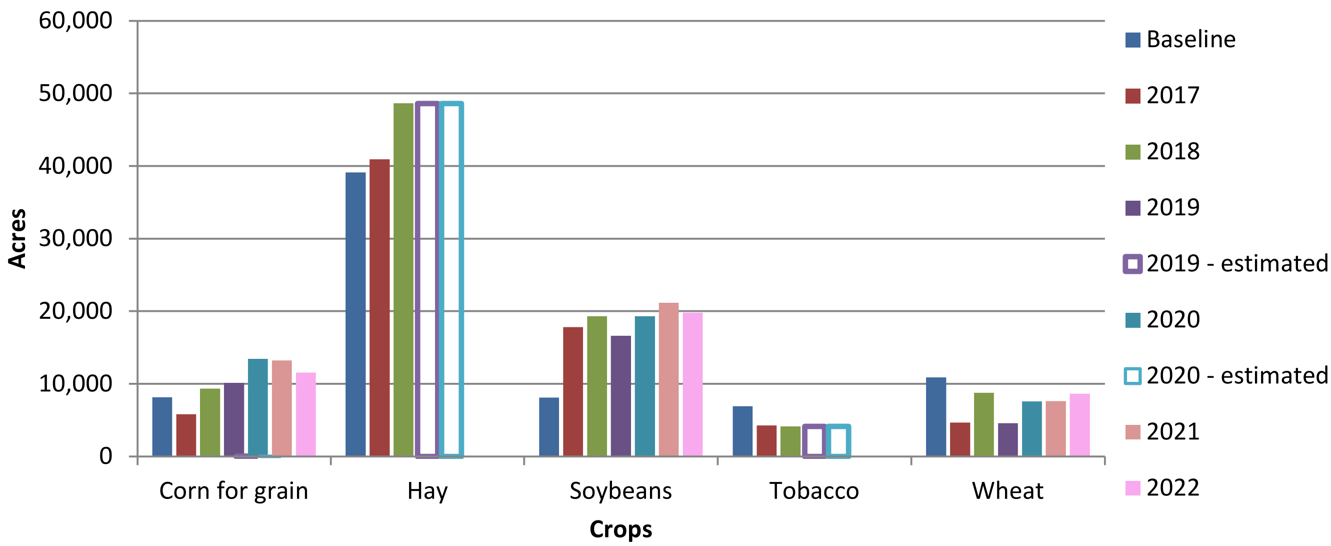
Figure 14. Acreage of Major Crops for the Baseline (1997-2001) and 2017 through 2022, Upper New Hope subwatershed, Jordan Lake Watershed*



**NASS discontinued reporting annual hay and tobacco acres starting in 2019. The hay and tobacco acreage graphed as estimated for 2019 and 2020 is the 2018 reported acreage.*

Of the cropland acres in the Jordan Lake Watershed, 95% are in the Haw subwatershed.

Figure 15. Acreage of Major Crops for the Baseline (1997-2001) and 2017 through 2022, Haw subwatershed, Jordan Lake Watershed*

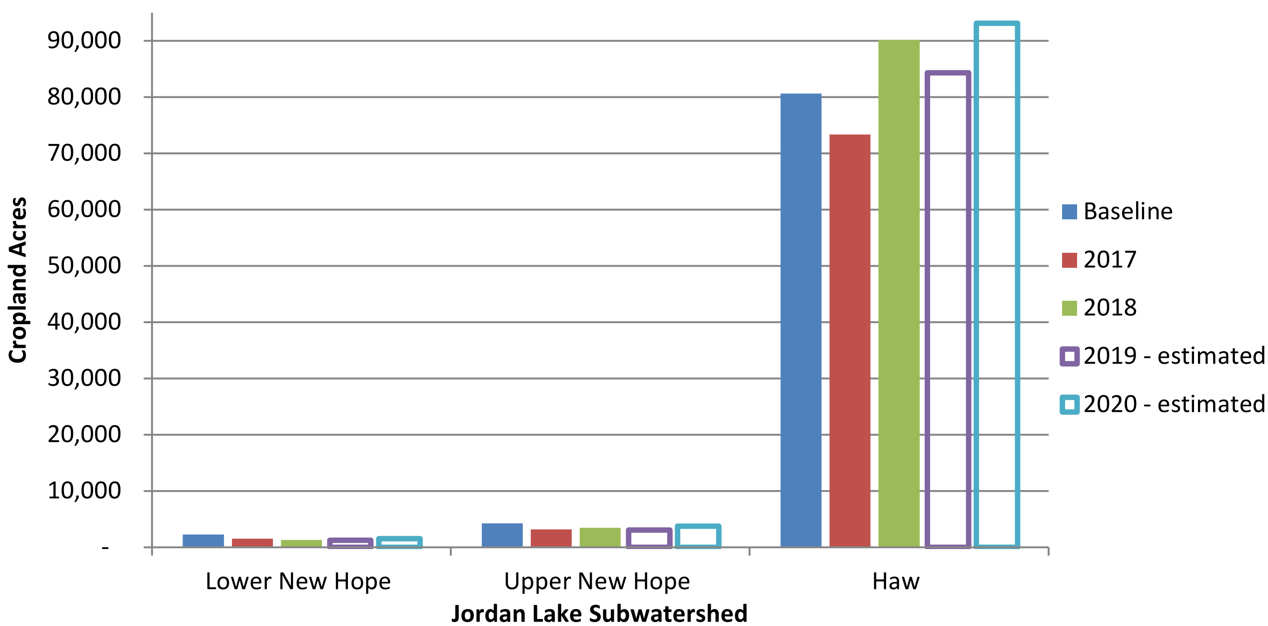


**NASS discontinued reporting annual hay and tobacco acres starting in 2019. The hay and tobacco acreage graphed as estimated for 2019 and 2020 is the 2018 reported acreage.*

Land Use Change to Development and Cropland Conversion

Cropland acres fluctuate every year due to cropland conversion and development. Each year, some cropland is permanently lost to development and some is converted to grass or trees and likely to be ultimately lost from agricultural production. Agricultural acres lost permanently to development are also not reported due to the varying accounting methodologies counties and municipalities employ in documenting land use changes in their jurisdictions (if such information is collected at all). In addition to development, cropland can be converted to other uses. The WOC tracks the acres of cropland that are converted to grass or trees through state or federal cost share programs. Since the baseline, the following cropland acres in each subwatershed have been converted to grass or trees through state or federal cost share programs: 47 acres in the Lower New Hope subwatershed, none in the Upper New Hope subwatershed and 2,366 acres in the Haw subwatershed. Due to the NASS data availability changes for hay and tobacco acreage, total cropland acres in each Jordan Lake subwatershed were not calculated for CY2022. Figure 16 displays the total cropland acres in the watershed in baseline and 2017 through 2020. In 2019 and 2020, a merged dataset consisting of NASS data from CY2018 and the respective crop year was used to estimate total cropland acres in the Jordan Lake watershed and its subwatersheds.

Figure 16. Total Cropland Acres in the Jordan Lake Watershed, Baseline (1997-2001) and 2017 through 2020*



**For CY2019 and CY2020, a merged dataset was used that consisted of CY2018 acres for hay and tobacco and current crop year acreages for all other crops reported by USDA NASS.*

Pasture Accounting

Pasture nitrogen loss is also calculated using NLEW and is based on the total number of pasture acres, pastured livestock, and implemented livestock exclusion systems in the watershed. Reported pasture acreage and livestock totals are collected every 5 years from the USDA Census of Agriculture, and implementation data for exclusion systems is collected from local Soil and Water Conservation District staff in the watershed. Because of this reporting cycle the next pasture-based nitrogen loss calculation will be included in a future report when the 2022 Census of Agriculture is published. In CY2017, the Upper New Hope subwatershed reported a 54% nitrogen loss reduction from baseline, the Lower New Hope subwatershed reported a 73% nitrogen loss reduction from baseline, and the Haw subwatershed reported a 49% nitrogen loss reduction from baseline. For pasture accounting, 2002 was chosen as the baseline year because the closest possible Census of Agriculture was collected and published based on 2002 data. Table 3 lists each county's baseline, CY2012 and CY2017 nitrogen (lbs/yr) loss values from pastureland, along with nitrogen loss percent reductions from the baseline in CY2012 and CY2017. For CY2017, all three subwatersheds have exceeded their mandated goals.

Table 3. Estimated reductions in pasture land nitrogen loss from baseline (CY2002) for CY2012 and CY2017, Jordan Lake Watershed

Upper New Hope: Goal of 35% Nitrogen Loss Reduction					
County	**2002 Nitrogen Loss (lbs) - Baseline †**	**2012 Nitrogen Loss (lbs)**	**2012 N Loss Reduction (%)**	**2017 Nitrogen Loss (lbs)**	**2017 N Loss Reduction (%)**
Chatham	28,977	18,328	37%	15,808	45%
Durham	19,952	8,615	56%	6,352	68%
Orange	20,350	9,892	51%	9,520	53%
Wake	655	261	60%	276	58%
Total	**69,554**	**37,096**	**47%**	**31,956**	**54%**
Lower New Hope: Goal of no net increase in Nitrogen Loss					
County	**2002 Nitrogen Loss (lbs) - Baseline †**	**2012 Nitrogen Loss (lbs)**	**2012 N Loss Reduction (%)**	**2017 Nitrogen Loss (lbs)**	**2017 N Loss Reduction (%)**
Chatham	57,923	17,642	70%	15,808	73%
Wake	1,386	332	76%	295	79%
Total	**59,309**	**17,974**	**70%**	**16,103**	**73%**

† *These figures were originally calculated using total watershed pasture acres. The Pasture Points Committee concluded that nitrogen loss should be calculated according to only the pasture acres which remain unbuffered at the time of each data collection. As a result, this column has been updated from what was reported previously.*

Table 3 continued. Estimated reductions in pastureland nitrogen loss from baseline (CY2002) for CY2012 and CY2017, Jordan Lake Watershed

Haw: Goal of 8% Nitrogen Loss Reduction					
County	**2002 Nitrogen Loss (lbs) - Baseline †**	**2012 Nitrogen Loss (lbs)**	**2012 N Loss Reduction (%)**	**2017 Nitrogen Loss (lbs)**	**2017 N Loss Reduction (%)**
Alamance	201,646	151,357	25%	129,550	36%
Caswell	61,026	27,717	55%	28,513	53%
Chatham	132,263	81,473	38%	68,434	48%
Guilford	211,063	110,495	48%	74,457	65%
Orange	20,313	9,124	55%	8,277	59%
Rockingham	46,637	29,733	36%	33,845	27%
Total	**672,948**	**409,899**	**39%**	**343,076**	**49%**

† *These figures were originally calculated using total watershed pasture acres. The Pasture Points Committee concluded that nitrogen loss should be calculated according to only the pasture acres which remain unbuffered at the time of each data collection. As a result, this column has been updated from what was reported previously.*

The reduction percentages reported above result from a combination of pastureland loss, fertilization decreases, stocking rate changes, and BMP implementation. Table 4 shows how these factors have changed in the Jordan Lake watershed since the 2002 baseline.

Table 4. Pasture operation changes from baseline (CY2002) for CY2012 and CY2017, Jordan Lake Watershed

Factor	Baseline (CY2002)	2012	2017	2002-2017 % Change
Pasture Land	99,595 acres	83,096 acres	74,478 acres	-25%
Fertilization†	103 lbs N/acre	81 lbs N/acre	80 lbs N/acre	-22%
Stocking Rate	0.58 animal units/acre	0.72 animal units/acre	0.68 animal units/acre	+18%
Livestock Exclusion System Implementation	976 acres	4,224 acres	6,022 acres	+517%

† *Total fertilization rate equals direct waste deposition times volatilization factor plus supplemental fertilizer application*

Phosphorus Indicators for CY2018 through CY2022 Since Baseline

The qualitative indicators included in Table 5 show the relative changes in land use and management parameters and their relative effect on phosphorus loss risk in the watershed from the baseline. This approach was recommended by the Phosphorus Technical Advisory Committee (PTAC) in 2005 due to the difficulty of developing an aggregate phosphorus tool parallel to the nitrogen NLEW tool.[6] The PTAC reconvened in April 2010 to make minor revisions for the tool's use in this watershed and the approach was approved for use in the Jordan Lake watershed by the Water Quality Committee of the EMC. This report includes phosphorus indicator data for the baseline period (1997-2001), from CY2018 through CY2022. Most of the parameters indicate less risk of phosphorus loss than in the baseline.

Phosphorus Technical Advisory Committee (PTAC):
The PTAC's overall purpose was to establish a phosphorus accounting method for agriculture in the basin. It determined that a defensible, aggregated, county-scale accounting method for estimating phosphorus losses from agricultural lands was not feasible due to "the complexity of phosphorus behavior and transport within a watershed, the lack of suitable data required to adequately quantify the various mechanisms of phosphorus loss and retention within watersheds of the basin, and the problem with not being able to capture agricultural conditions as they existed in 1991." [6] The PTAC instead developed recommendations for qualitatively tracking relative changes in practices in land use and management related to agricultural activity that either increase or decrease the risk of phosphorus loss from agricultural lands in the basin on an annual basis.

Contributing to the reduced risk of phosphorus loss since baseline is the reduction in the acres of tobacco, the decrease in the amount of animal waste phosphorus, and significant conservation tillage on cropland in the watershed.

The soil test phosphorus median number reported for the watershed fluctuates each year due to the nature of how the data is collected and compiled. The soil test phosphorus median numbers shown in Table 5 are generated by using NCDA&CS soil test laboratory results from voluntary soil testing on agricultural land and the data is reported by the NCDA&CS. The number of samples collected each year varies. The data does not include soil tests that were submitted to private laboratories. The soil test results from the NCDA&CS database represent data from entire counties in the watershed and have not been adjusted to include only those samples collected in the Jordan Lake watershed.

[6] Johnson, Amy M. and Deanna L. Osmond. 2005. Final Report for the Accounting Method for Tracking Relative Changes in Agricultural Phosphorus Loading to the Tar-Pamlico River. Department of Soil Science, North Carolina State University, Raleigh, NC 27606.

Table 5. Relative Changes in Land Use and Management Parameters and their Relative Effect on Phosphorus Loss Risk in the Jordan Lake Watershed Since Baseline

Parameter	Units	Source	Baseline (average 1997-2001)	CY2018	CY2019	CY2020	CY2021	CY2022	Percent change (baseline to CY2022)	CY2022 P Loss Risk +/-
Reported Cropland (annual)	Acres	NC Ag Statistics	88,031**	95,004	88,559▪	98,342▪	-₪	-₪	-	-/+
Cropland conversion to Grass & Trees (cumulative)	Acres	USDA-NRCS & NCACSP	1,359	2,266	2,297	2,342	2,396	2,413	78%	-
Conservation tillage[7] (10-year window)	Acres	USDA-NRCS & NCACSP	1,997	19,645	19,645	2,022†	2,109†	2,008†	1%	-
Vegetated buffers (cumulative)	Acres	GIS analysis	58,561**	52,861	52,861	52,861	52,880	52,919	-10%‡	+
Tobacco acres (annual)	Acres	USDA-NRCS & NCACSP	7,728**	4,302	-§	-§	-§	-§	-§	-/+
Unfertilized Cover Crops (annual)	Acres	USDA-NRCS & NCACSP	0	2,895	2,845	2,500	3,369	2,765	2,765%	-
Animal waste P (annual)	lbs of P/ yr	NC Ag Statistics	7,310,274	4,539,692	4,670,020	4,799,688	4,751,444	4,727,941	-35%	-
Soil test P median (annual)	P-Index	NCDA& CS	72	64	71	78	74	76	6%	+

▪ *CY2019 and CY2020 reported cropland approximates hay and tobacco acreage at CY2018 levels.*

₪ *Total cropland was not reported for CY2021 given hay and tobacco acreage data availability changes. See the 'Scope of Report and Methodology' section for details.*

† *Contracted conservation tillage acres are notably lower than CY2019 data because older contracts implemented at the start of annual reporting have since expired. Conservation tillage continues to be widely used.[7]*

‡*Total acres of buffers have slightly decreased. Additional agricultural land in the Jordan Lake watershed may be buffered as a result of Division of Mitigation Services activities in the watershed, which cannot be included in this report for nutrient reduction credit.*

§ *Tobacco acreage was last reported by NASS in 2018. Tobacco acreage declined in North Carolina since the phase out of the Federal Tobacco Quota Program and enactment of the Fair and Equitable Tobacco Reform Act in 2004. The Jordan Lake watershed is not an exception to this statewide trend and has seen a decline in tobacco acreage grown since baseline.*

****Baseline values for reported cropland, vegetated buffers, and tobacco acres were updated to correspond to information stored in NLEW 6.0.*

---

[7] Conservation tillage is being practiced on additional acres, but this number only reflects acres under active cost share contracts approximated by a ten-year rolling window. Acres where farmers have adopted the use of conservation tillage without cost share assistance are not included. An estimated 93% of producers are practicing conservation tillage on cropland in the Jordan Lake watershed. Source: *O'Connell, C. and D.L. Osmond. 2018. Carolina Dreamin': A case for understanding farmers' decision-making and hybrid agri-environmental governance initiatives in agricultural communities as complex assemblages in Agri-environmental Governance as an Assemblage: Multiplicity, Power, and Transformation. Editors: Jérémie Forney, Hugh Campbell, Chris Rosin. Rutledge Press.*

The WOC finds that the decreased risk of P loss from baseline is associated with the following three important parameters:

- continued high adoption of conservation tillage;
- decrease in animal waste phosphorus; and
- decrease in tobacco acreage.

A 35% reduction in animal waste phosphorus is due primarily to an overall reduction in watershed animal numbers. Many dairy operations in the watershed have permanently closed since baseline and a large poultry processing plant in Siler City was temporarily closed, which decreased the demand for broilers in the region and resulted in a significant downturn in production. The Siler City poultry processing plant reopened in 2019 and as of 2022 was operating at their 250,000 broilers per day production capacity. The WOC expects local producers to meet increased demand incrementally, which could increase animal waste phosphorus produced annually. A substantial increase in animal waste phosphorus produced annually would have to occur to increase phosphorus loss risk from baseline (1997 – 2001) for the animal waste phosphorus category tracked in Table 5. From baseline (average of animal counts from 1997 to 2001) to CY2022, the Jordan Lake watershed has seen an increase in approximately 340,000 inventoried layers and pullets and declines of nearly 7.5 million broilers, over 12,000 swine, and nearly 16,000 cattle.

Most poultry operations are deemed permitted in North Carolina. Operations that are deemed permitted have: (1) fewer animals than the state requires to obtain a state permit or (2) have a waste management system that does not require a state or federal permit. Most poultry operations have dry-litter poultry waste management systems and do not require any additional state or federal permits. Owners or operators of dry-litter poultry waste facilities are, however, required to adhere to rules set forth under 15A NCAC 02T .1303 (Permitting by Regulation) and General Statute 143-215.10C, which include minimum stream setbacks, land application rates, soil analysis, and recordkeeping requirements. Because specific information about the location, number of animals, amount of dry-litter poultry waste produced and fields on which the dry-litter poultry waste is applied is unknown, the extent of potential impacts to water quality due to nutrient contributions from dry-litter poultry waste is difficult to ascertain.

Relative to CY2022 and the baseline, the WOC recommends that no additional management actions be required of agricultural operations in the watershed to comply with the phosphorus goals of the agriculture rule based on currently available data. The WOC will continue to track and report the identified set of qualitative phosphorus indicators to the Division of Water Resources (DWR) annually, and to bring any concerns raised by the results of this effort to the DWR's attention as they arise, along with recommendations for any appropriate action. The WOC expects that BMP implementation may continue to increase throughout the watershed in future years, and notes that BMPs installed for nitrogen and sediment control often provide significant phosphorus benefits as well.

Due to the number of permitted human biosolids application fields in the piedmont, the Jordan Lake Watershed Oversight Committee also initially recommended adding tracking of the annual application of biosolids, but ultimately removed this element from the tracking methodology due to lack of readily accessible biosolids data. Since then, human biosolids applicators have begun submitting annual reports electronically to DEQ in a digital Portable Document Format (PDF) and that data is manually entered into a DEQ database. However, the data are not complete nor in a useable format. To improve nutrient management strategies that are part of the residuals (human biosolids) application program, the WOC recommends DEQ provide rate, nutrient content, and spatial application information for permitted biosolids application data in a usable format for incorporation in future reporting.

BMP Implementation Not Tracked by NLEW

Not all types of nutrient- and sediment-reducing best management practices (BMPs) are tracked by NLEW. Other BMPs include: livestock-related nitrogen and phosphorus reducing BMPs, BMPs that reduce soil and phosphorus loss, and BMPs that do not have enough scientific research to support estimating a nitrogen benefit. The WOC believes it is worthwhile to recognize these practices because overall conservation practice implementation gives a comprehensive picture of the work that is being done on agricultural land in the watershed. Table 6 identifies these BMPs and tracks their implementation in the watershed since the end of the baseline period.

Table 6. Best management practices installed from 2002 to 2022, Jordan Lake Watershed*

Conservation Practice	Units	2002-2022 (cumulative)	2012-2022 (active contracts – 10-year rolling window)
Ag road repair-stabilization	feet	3,207	327
Agricultural pond restoration/repair	units	26	9
Closure-waste impoundments	units	21	4
Conservation cover	acres	862	77
Constructed wetland	acres	2	0
Critical area planting	acres	88	22
Cropland conversion - grass	acres	1,322	314
Cropland conversion - trees	acres	1,092	230
Diversion	feet	5,412	340
Fencing (USDA programs)	feet	80,587	73,846
Field border	acres	166	25
Filter strip	acres	0.4	0
Grassed waterway	acres	319	29
Habitat management	acres	332	35
Nutrient management	acres	5,540	430
Nutrient management plan	no.	30	1
Pasture renovation	acres	3,325	503
Pastureland conversion to trees	acres	31	0
Pond	no.	2	1
Prescribed grazing	acres	7,167	3,445
Sediment control basin	units	2	0
Sod-based rotation	acres	11,307	1,609
Streambank and shoreline protection	feet	18,816	1,911
Terrace	feet	20,409	0

** Additional BMPs may exist in the watershed as producers may maintain practices after the life of a cost share contract, and other practices are installed by farmers without cost share assistance.*

Looking Forward

WOC recognizes the dynamic nature of agricultural business:

- Urban encroachment (e.g., crop selection and production shifts as fields become smaller)
- Age of farmer (e.g., as retirement approaches farmers may move from row crops to livestock)
- Changes in the world economies, energy or trade policies
- Changes in government programs (e.g., commodity support, crop insurance or environmental regulations)
- Weather (e.g., long periods of drought or rain)
- Scientific advances in agronomics (e.g., production of new types of crops or improvements in crop sustainability)
- Plant disease or pest problems (e.g., viruses or foreign pests).

The Jordan Lake WOC will continue to improve rule implementation, relying heavily on the local Soil and Water Conservation Districts working directly with farmers to assist with best management practice design and installation.

Because cropping shifts are susceptible to various pressures, the WOC continues to encourage BMP implementation on both cropland and pastureland that provides for a lasting reduction in nitrogen and phosphorus loss in the watershed while monitoring cropping changes. Previously, members of the Falls and Jordan Lake WOCs worked with DWR on issues regarding nutrient offsets that arise from trades involving agricultural land. The WOC will continue to stay engaged if additional offset work involving agriculture land occurs in the watershed.

The WOC supports and recommends additional research on accounting procedures for pasture operations. Similarly, the WOC supports DWR efforts to provide information on human biosolids applications on agricultural acres in a usable format. When such data becomes available, the WOC will consider whether separate accounting for human biosolids nutrient applications is feasible and appropriate.

Funding for technical assistance and BMP implementation is necessary to successfully reach and maintain agricultural nutrient reduction goals. In 2001, grants from several sources funded a total of two watershed technicians and two basin coordinators to work within the Jordan Lake watershed. The technicians' primary responsibility was to assist farmers with BMP implementation and to support existing county staff to expedite the installation of nutrient reducing BMPs in the basin. On June 30, 2015 the last technician funding was expended, and technician funding is no longer eligible for grant awards by funding entities in the state. Concurrent budget changes at the USDA in the early to mid-2000s also resulted in statewide restructuring of North Carolina NRCS field staff and led to a reduction in federally-funded technical capacity at the local level. Therefore, less technical assistance for BMP implementation is available and ongoing responsibility for conservation practice planning and installation now largely depends on local staff with other duties and escalating workload and capacity demands.

Sufficient funding is also necessary for data collection and reporting activities to track the agriculture community's progress in meeting nutrient reduction goals. Technicians and basin coordinators previously supported by grant funds used to assist with reporting requirements for the Neuse and Tar-Pamlico Agriculture Rules. At present, there is no funding for a specific Jordan Lake watershed coordinator. In addition to other duties, the Nonpoint Source Planning Coordinator position within the NCDA&CS Division of Soil and Water Conservation funded by EPA 319(h) funds has been assigned the agriculture data collection, compilation and reporting duties for all basins and watersheds under Nutrient Sensitive Waters Agriculture Rules. Because most district staff have neither the time nor financial resources to synthesize county level data with watershed technician and coordinator funding eliminated, a more centralized approach to annual reporting data collection and verification through GIS analysis or other tools is necessary. Automating data collection and verification may come at the expense of local knowledge. Annual agricultural reporting is required by the rules; therefore, continued funding for the Division's only remaining nutrient coordinator position is essential for compliance.

Previously, funding was available for research on conservation practice effectiveness, realistic yields, and nitrogen use efficiencies. Due to grant eligibility changes and other funding constraints, it is unlikely that new data will be developed. Prior funding sources for such research, which provided much of the scientific information on which NLEW was based, are no longer available. Should new funding be made available, additional North Carolina-specific research information could be incorporated into future NLEW updates.

Phosphorus accounting and reporting will continue to address qualitative factors and evaluate trends in agricultural phosphorus loss annually. Periodic land use surveys with associated use of the Phosphorus Loss Assessment Tool (PLAT) are needed every five years, but it is unlikely that funding will be available for this activity. Additionally, understanding of agricultural phosphorus management could be improved through in-stream monitoring, which is also contingent upon the availability of funding and staff resources.

In upcoming years, the WOC anticipates engaging with other watershed stakeholders in discussions on watershed-scale priorities and the potential establishment of a "One Water" framework for incentivizing work in and around the Jordan Lake watershed to promote pollutant reduction alongside economic development and community resilience. The "One Water" integrated watershed management movement in the Jordan Lake watershed is led by Jordan Lake One Water, a stakeholder coalition working in partnership to build watershed-wide consensus on how to address issues impacting water resources.

Conclusion

The Jordan Lake WOC will continue to monitor and evaluate crop trends. The current shift to and from crops with higher nitrogen requirements may continue to influence the yearly reduction. Significant progress has been made in agricultural nitrogen and phosphorus loss reduction to achieve reduction goals; however, the measurable effects of BMPs on overall in-stream nitrogen reduction may take years to develop due to the nature of non-point source pollution. Nitrogen reduction values presented in this summary of agricultural reductions reflect "edge-of-management unit" calculations that contribute to achieving the nitrogen loss reduction goals. Significant quantities of agricultural BMPs have been installed since the adoption and implementation of the nutrient management strategy, and agriculture continues to fulfill its responsibilities toward achieving the overall nutrient reduction goals in the Jordan Lake watershed.