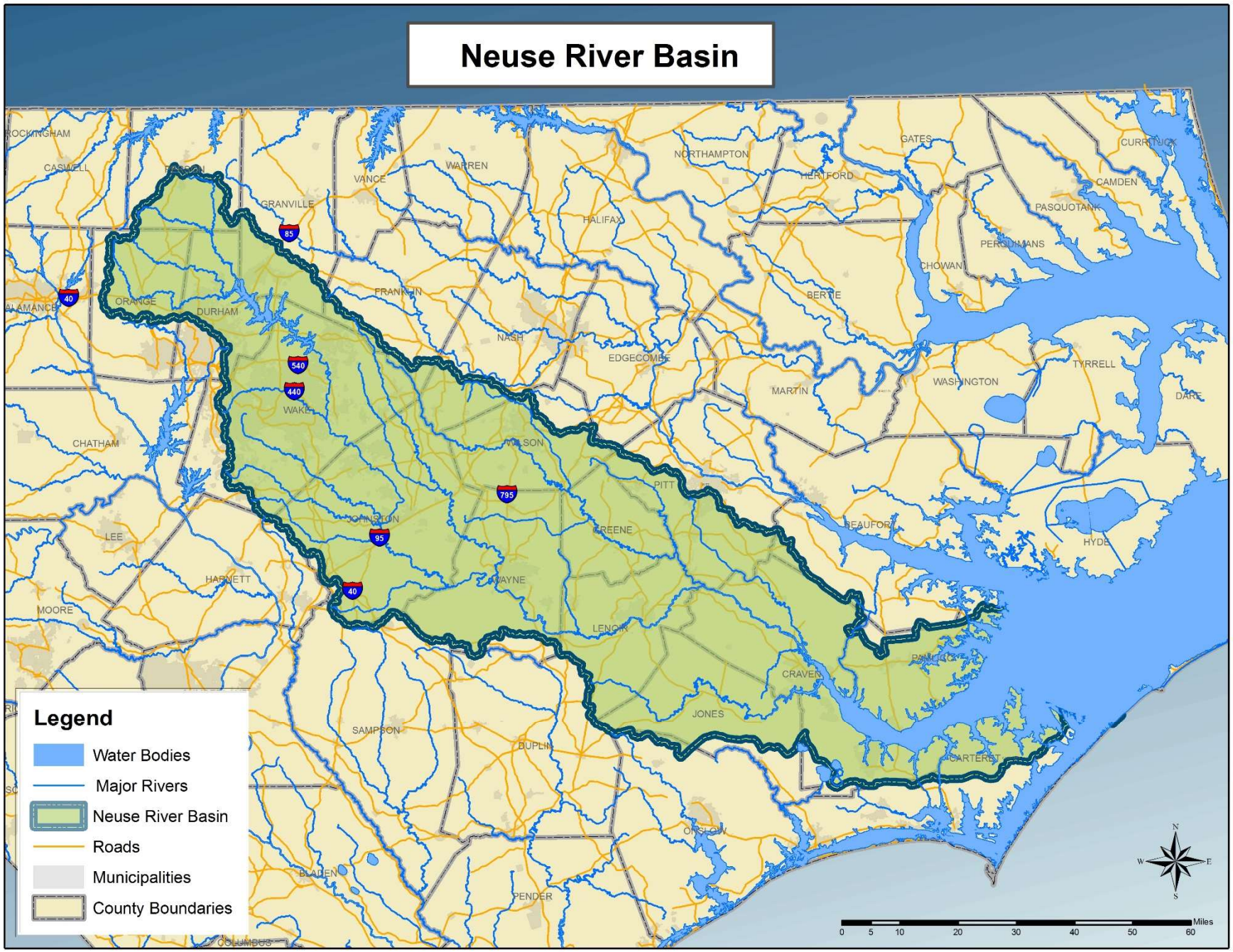
NCDA&CS

2024 Annual Progress Report (Crop Year 2023) on the Neuse Agricultural Rule (15 A NCAC 2B.0712)

A Report to the Division of Water Resources from the Neuse Basin Oversight Committee: Crop Year 2023

Date approved by Neuse Basin Oversight Committee: 11/8/2024
Date submitted to NC Division of Water Resources: 1/7/2025


Neuse River Basin
ROCKINGHAM
CASWELL
ALAMANCE
ORANGE
DURHAM
GRANVILLE
VANCE
WARREN
FRANKLIN
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WAKE
CHATHAM
LEE
HARNETT
MOORE
JOHNSTON
WILSON
EDGECOMBE
NORTHAMPTON
HALIFAX
GATES
HERTFORD
CHOWAN
PERQUIMANS
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WASHINGTON
TYRRELL
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Summary

The Neuse Basin Oversight Committee (BOC) received and approved crop year (CY[1]) 2023 annual reports estimating the progress from the seventeen Local Advisory Committees (LACs) operating under the Neuse Agriculture rule as part of the Neuse Basin Nutrient Management Strategy. This report demonstrates agriculture's ongoing collective compliance with the Neuse Agriculture Rule and estimates producer progress in decreasing nutrients. In CY2023, agriculture collectively achieved an estimated 53% reduction in nitrogen loss from agricultural lands compared to the 1991-1995 baseline, continuing to exceed the rule-mandated 30% reduction. Sixteen LACs exceeded the 30% reduction goal established by the BOC. Significant reasons contributing to nitrogen reduction levels seen in CY2023 in comparison to baseline include reduction in reported crops, cropping shifts to crops with lower nitrogen demands, and reduced application rates.

Rule Requirements and Compliance History

Neuse Nutrient Sensitive Waters (NSW) Strategy

The Environmental Management Commission (EMC) adopted the Neuse NSW strategy in December 1997. The NSW strategy goal was to reduce the average annual load of nitrogen delivered to the Neuse River Estuary by 2003 from both point and non-point source pollution by a minimum of 30% of the average annual load from the baseline period (1991-1995). Mandatory nutrient controls were applied to address non-point source pollution in agriculture, urban stormwater, nutrient management, and riparian buffer protection. The Neuse River Estuary is still classified as an impaired water and water quality monitoring data show the overall strategy for all regulated sectors has not yet reduced total nitrogen loading to the estuary by 30%.

Effective December 1997, the rule provides for a collective strategy for farmers to meet the 30% nitrogen loss reductions within five years. A BOC and seventeen LACs were established to implement the Neuse Agriculture rule and to assist farmers with complying with the rule.

All seventeen Local Advisory Committees (LACs) submitted annual county data reports as required in 2024. LACs submitted their first annual report to the BOC in May 2002. That report estimated a collective 38% reduction in nitrogen loss with 12 of the 17 LACs exceeding 30% individually. In 2003, all LACs achieved their BOC recommended reduction goal. Sixteen counties are currently meeting their 30% nitrogen reduction goal for CY2023. The Division of Soil and Water Conservation staff uses data provided by the LACs to calculate annual reductions using the aggregate Nitrogen Loss Estimation Worksheet (NLEW) tool. Adjustments are made to aggregate NLEW periodically to reflect the most up-to-date scientific research. These revisions lead to adjustments in both individual LAC and basinwide nitrogen loss reduction rates.

[1] The 2023 crop year began October 1st, 2022, and ended September 30th, 2023.

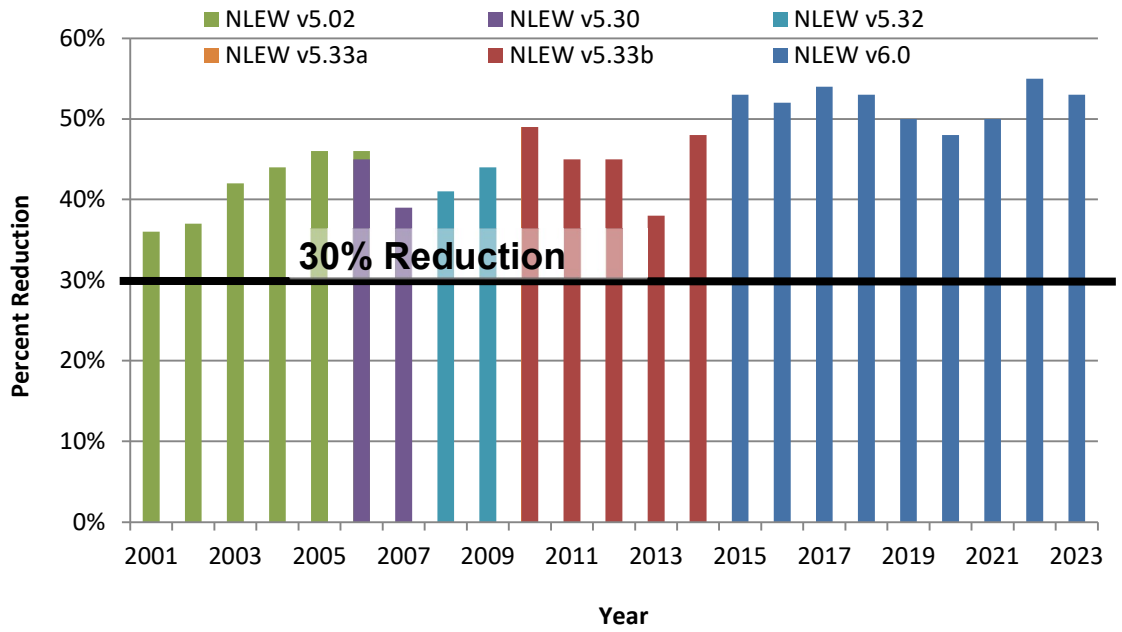
Scope of Report and Methodology

The estimates provided in this report represent whole-county scale calculations of nitrogen loss from cropland agriculture adjusted for acreage in the basin. These estimates were made by NC Division of Soil and Water Conservation (DSWC) staff using the 'aggregate' version of the Nitrogen Loss Estimation Worksheet, or NLEW, an accounting tool developed to meet the specifications of the Neuse Rule and approved by the EMC. The NLEW development team included interagency technical representatives of the NC Division of Water Resources (DWR), NC DSWC and USDA-Natural Resources Conservation Service (NRCS) and was led by NC State University Soil Science Department faculty. The NLEW captures application of both inorganic and animal waste sources of fertilizer to cropland. It does not capture the effects of nitrogen applied to pastureland and NLEW is an "edge-of-management unit" accounting tool; it estimates changes in nitrogen loss from croplands, but does not estimate changes in nitrogen loading to surface waters.

Annual Estimates of Nitrogen Loss and the Effect of NLEW Refinements

The NLEW software is periodically revised to incorporate new knowledge gained through research and improvements to data. These changes have incorporated the best available data, but changes to NLEW must be considered when comparing nitrogen loss reduction in different versions of NLEW. Further updates in soil management units are expected as NRCS produces updated electronic soils data. The small changes in soil management units are unlikely to produce significant effects on estimates of nitrogen loss reductions. Figure 1 represents the annual percent nitrogen loss reduction from the baseline for 2001 to 2023.

Figure 1. Collective Nitrogen Loss Reduction Percent 2001 to 2023 Based on NLEW, Neuse River Basin.



The first NLEW reports were run in 2001, and agriculture has continued to exceed its collective 30% nitrogen reduction goal since that time. The first NLEW revision (v5.31) marked a significant decrease in the nitrogen reduction efficiencies of buffers based on best-available research information, so baseline and CY2005 were re-calculated, and soil management units were revised. The second (v5.32) and third (v5.33a) revisions were minor updates of soil mapping units. In April of 2011 the NLEW Committee established further reductions (v5.33b) in nitrogen removal efficiencies for buffers based on additional research. In 2016 NLEW software was updated (v6.0) from outdated software and transferred to a web-based platform on NCDA&CS servers. Revised realistic yield and nitrogen use efficiency data from NCSU were incorporated, and some minor calculation errors were corrected for corn, sweet potatoes, and sweet corn. The modernized web-based NLEW software (v6.0) was updated to pull revised realistic yield and nitrogen use efficiency data from the North Carolina Realistic Yield Database[2]. Table 1 lists the changes in buffer nitrogen reduction efficiencies over time.

Table 1. Changes in Buffer Width Options and Nitrogen Reduction Efficiencies in NLEW

Buffer Width	NLEW v5.02 % N Reduction 2001-2005	NLEW v5.31, v5.32, v5.33a % N Reduction 2006-2010	NLEW v5.33b, v6.0 % N Reduction 2011-Current
20’	40% (grass)* 75% (trees and shrubs)*	30%	20%
30'	65%	40%	25%
50'	85%	50%	30%
70'	85%	55%	30%
100'	85%	60%	35%

**NLEW v5.02 - the vegetation type (i.e. trees, shrubs, grass) within 20' and 50' buffers determined reduction values. Based on research results, this distinction was dropped from subsequent NLEW versions.*

[2] The North Carolina Realistic Yield Database is the product of an extensive data gathering and review process conducted by many state and federal partners. The North Carolina Realistic Yield Database is maintained and updated by North Carolina State University.

North Carolina Interagency Nutrient Management Committee. 2014. Realistic yields and nitrogen application factors for North Carolina crops. realisticyields.ces.ncsu.edu
North Carolina State University, North Carolina Department of Agriculture and Consumer Services, North Carolina Department of Environment and Natural Resources, Natural Resources Conservation Service. Raleigh NC.

Current Status

Nitrogen Reduction from Baseline for CY2023

All seventeen LACs submitted their twenty-second annual reports to the BOC for approval in August 2024. For the entire basin, in CY2023 agriculture achieved a 53% reduction in nitrogen loss compared to the 1991-1995 baseline. This percentage is 2% lower than the basinwide reduction reported for CY2022. Table 2 lists each county's baseline, CY2022 and CY2023 nitrogen (lbs/yr) loss values, and nitrogen loss percent reductions from the baseline in CY2022 and CY2023.

In 2024, the Division of Soil and Water Conservation was successful in requesting georeferenced Farm Service Agency cropland data for the first time in the history of annual reporting for the Neuse Basin. Prior to receiving this new dataset, cropland data in the Neuse Basin was approximated by multiplying publicly released FSA county-aggregated cropland data by the percentage of land in the county lying within the Neuse Basin. Each year Local Advisory Committees, through member knowledge of farm, operator, and crop planting locations, helped to further refine and adjust county cropland acreage totals in the basin estimated according to this methodology. The new georeferenced FSA cropland dataset provides the most accurate assessment of cropland acreage in the Neuse Basin since reporting began. The Basin Oversight Committee commends the enhanced collaboration and partnership between USDA-FSA and the NCDA&CS DSWC that made this new stage of data-sharing possible and allows for a more accurate delineation of cropland in the Neuse Basin.

Comparing georeferenced CY2023 data to baseline totals estimated using the previous, best-available methodology at the time presents some challenges. As shown in Table 2 below, most counties (10) in the Neuse Basin experienced only moderate nitrogen-loss reduction changes between CY2022 and CY2023 (less than +/- 10%). A subset of counties (5) experienced slightly higher swings (less than +/- 15%) and two counties experienced more significant swings (greater than +/- 20%). Steeper drops in county nitrogen-loss reductions were precipitated by significantly more cropland acreage reported in the Neuse Basin portions of each county than was estimated in baseline. Sharper rises in county nitrogen-loss reductions were caused by reductions of county cropland acreage reported in the Neuse Basin. The significant nitrogen reduction shifts seen in Table 2 are not due to major agricultural management changes or new crop cultivation trends in the basin or within specific counties.

*Table 2. Estimated Reductions in Agricultural Nitrogen Loss from Baseline (1991-1995) for CY2022 and CY2023, Neuse River Basin**

County	Baseline N Loss (lb)	CY2022 N Loss (lb)*	CY2022 N Reduction (%)	CY2023 N Loss (lb)* ϕ	CY2023 N Reduction (%) ϕ
Carteret	1,292,586	378,087	71%	709,540	45%
Craven	4,153,187	1,952,765	53%	2,453,181	41%
Durham	220,309	35,011	84%	56,896	74%
Franklin	219,209	43,763	80%	67,303	69%
Granville	193,197	53,666	72%	1,375	99%
Greene	4,439,036	2,168,241	51%	1,965,397	56%
Johnston	6,728,638	3,085,130	54%	2,595,348	61%
Jones	3,283,906	1,583,293	52%	2,021,795	38%
Lenoir	4,455,752	2,624,696	41%	2,666,905	40%
Nash	1,042,072	439,891	58%	575,797	45%
Orange	787,040	78,352	90%	118,456	85%
Pamlico	2,023,294	1,604,866	21%	1,796,473	11%
Person	616,669	202,824	67%	197,002	68%
Pitt	3,399,455	1,631,975	52%	2,097,425	38%
Wake	1,434,602	293,846	80%	273,149	81%
Wayne	8,297,408	3,017,864	64%	2,722,971	67%
Wilson	3,273,647	1,622,082	50%	1,332,423	59%
Total	45,860,007	20,816,352	55%	21,651,436	53%

** Nitrogen loss values are for comparative purposes. They represent nitrogen that was applied to agricultural lands in the basin and neither used by crops nor intercepted by BMPs in a Soil Management Unit, based on NLEW calculations. This is not an in-stream loading value.*
Φ Nitrogen loss reduction values are calculated using more accurate georeferenced cropland information from FSA that was obtained for the first time in summer 2024.

Nitrogen loss reductions in CY2023 were achieved through a combination of fertilization rate decreases, cropping shifts, BMP implementation, and cropland acreage fluctuations. Some of this cropping shift is due to the need for regular rotations on agricultural operations. In order to minimize the threat of disease the double-crop planting of wheat and soybeans is usually followed by a corn crop, consequently fluctuations within this rotation are to be expected from year to year even in the face of similar weather conditions. In CY2023, overall corn planting increased by 22,067 acres from CY2022 totals. Soybean acres increased by 17,028 acres from CY2022 totals. Cotton acreage decreased by 31,252 acres from CY2022 totals. Tobacco and hay acreage (bermuda and fescue) experienced minimal decreases (228 acres and 190 acres respective) and wheat acreage experienced a moderate increase of 6,143 acres from CY2022 totals. Fluctuating weather conditions markedly impact annual cropping shifts by affecting farmers' ability to prepare fields for harvest and planting as well as overall crop health and yield. The winter of 2022-2023 was generally warm (January, February) and dry (December, February); however, the month of December was distinctly cool, and January had higher than

typical precipitation.[3] Overall, 2023 concluded as a year characterized by oscillations from the norm. Cooler seasons were atypically warm and warmer seasons began uncharacteristically cool. Late April precipitation brought localized flooding in eastern counties and a significant, extended period of drought followed in the fall (September to November). The year is among the state's top ten warmest years on record[3] and record corn yields were reported throughout the state. Factors that influence agricultural nitrogen reductions, calculated from NLEW outputs, are shown in Table 3.

*Table 3. Factors That Influence Nitrogen Reduction on Agricultural Lands (by percentage), Neuse River Basin Since Baseline**

Practice	CY2020	CY2021	CY2022	CY2023
BMP implementation	5%	5%	5%	5%
Fertilization management	11%	12%	12%	10%
Cropping shift	15%	16%	21%	21%
Cropland converted to grass/trees	2%	2%	2%	2%
Cropland lost to idle land	7%	7%	7%	7%
Cropland lost to development**	8%	8%	8%	8%
Total	48%	50%	55%	53%

**Percentages are based on a total of the reduction from baseline, not a year-to-year comparison.*
***Acreage of cropland lost to development has not been tracked since CY2017.*

Pamlico County is currently reporting an 11% nitrogen loss reduction from baseline, which is a 10% decrease in reduction from CY2022. In CY2023 Pamlico County reported 34,279 acres of crops, a 244 acre increase in total crops from CY2022, and almost 1,700 additional acres of corn from CY2022 totals. A little over 40% of the NLEW-reportable cropland acreage grown in Pamlico County in CY2023 was corn. In baseline, Pamlico was estimated to have fertilized corn at 165 lbs N per acre. In CY2023 (and in recent crop years), Pamlico has estimated that corn is fertilized at around 180 lbs N per acre. In CY2023, Pamlico also reported 3,351 fewer acres of water control structure BMP acreage from baseline. The water control structure acreage data run through aggregate NLEW for Pamlico County is estimated to affect approximately 11% of the total cropland acreage grown. A significant reason why Pamlico has dropped below the 30% reduction target in CY2023 is that more corn acreage was grown in the county in CY2023 than in CY2022 and that corn is fertilized at a higher rate than was estimated in baseline. Additionally, Pamlico's reduction of water control structure BMP acreage from baseline, as a result of the methodology reporting change described in the BMP Implementation section

[3] Davis, C. 2023. Winter Recap 2022-23: Snow is Scarce, Blooms Come Early. Prepared by North Carolina State Climate Office for the Climate Blog, Climate Summary. https://climate.ncsu.edu/blog/2023/03/winter-recap-2022-23-snow-is-scarce-blooms-come-early/

below, also contributed to its dip below the reduction target in CY2023. Significant BMP installation has occurred in Pamlico County since baseline including a 208% increase in riparian buffers implemented. Over 40% of agricultural land in Pamlico County is estimated to be in some form of controlled drainage utilizing water control structures. Farmers in the county remain committed to reducing nutrient losses from agricultural land. The Pamlico Soil and Water Conservation District board took tremendous steps in 2022 and 2023 to complete necessary data collection and re-calculation activities to add structures no longer under active contract, but determined to be functional and managed for water quality benefits, back into county BMP totals. Pamlico County will continue to work toward reducing nitrogen loss from agricultural land to meet the 30% reduction target.

BMP Implementation

BMP implementation is one of the factors that influence nitrogen reduction on agricultural land. In low elevation coastal counties near and around the Neuse estuary the predominant BMPs implemented by agricultural producers are water control structures. These practices are normally implemented to increase denitrification of agricultural drainage water and reduce surface phosphorus losses, but they can also control salinity and soil moisture as added co-benefits. Many water control structures in use in the Neuse Basin were implemented over a decade ago and are no longer under active cost-share contracts with operation and maintenance agreements. Currently, funding for water control structures through federal programs is prioritized to projects also alleviating saltwater intrusion concerns. Every effort is made to ensure that BMPs reported continue to function as designed and are maintained appropriately. Verification of functionality and appropriate management requires site visits to individual farm owners who may or may not have this BMP under an active cost-share contract. Coastal counties have reported that despite contract expirations for practices installed more than 10 years ago, some of the water control structures no longer covered by an operation and maintenance agreement are still functional and being actively managed by producers.

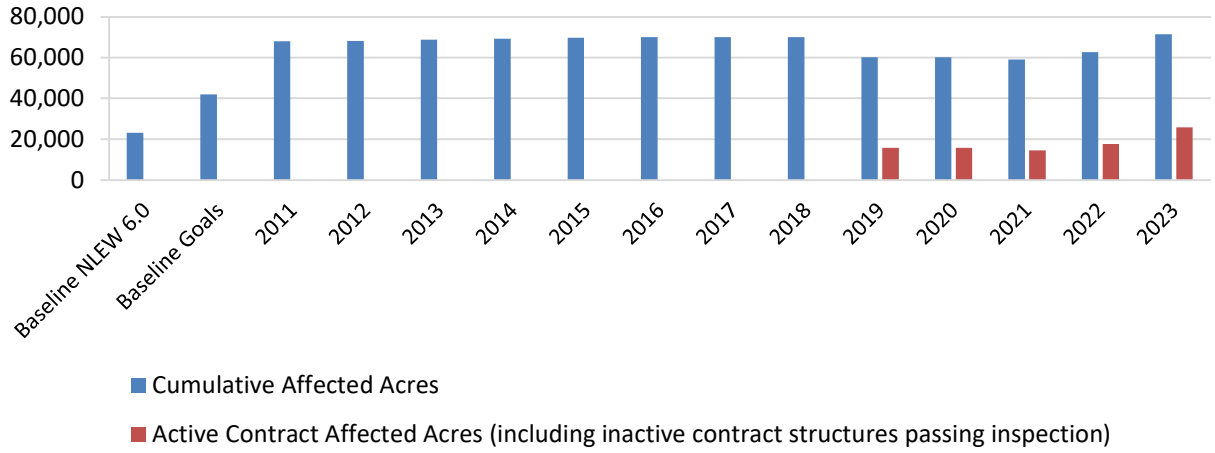
In this report, all acres affected by water control structures reported in CY2013 were manually removed from each county's total to ensure that all affected acres currently being reported are for active contracts only with operation and maintenance agreements. Carteret County and Pamlico County are exceptions. From CY2015 to CY2022, Carteret only reported crop acreage for Open Grounds Farm since this facility grows the vast majority of reportable crops in the portion of the county lying within the Neuse River Basin. With the new georeferenced FSA dataset, all NLEW reportable cropland in Carteret County was included in reporting this year. However, Open Grounds Farm still grows the most acreage of reportable crops in Carteret County's portion of the Neuse River Basin. Between CY2019 and CY2022, approximately 60% of the acres reported for Open Grounds Farm were reported as acres affected by water control structures based on consultation with Carteret Soil and Water Conservation District staff in 2020. All other water control structure affected acres previously recorded in Carteret County up to CY2019 were removed from cumulative and active contract totals for the county since most of those properties were no longer under active cultivation. For CY2023 reporting, Soil and Water Conservation District staff were asked to confirm total acres of cropland under actively maintained, controlled drainage via water control structures with the Open Grounds farm manager. District staff reported 22,000 acres were under controlled drainage in CY2023, and as a result total water control structure affected acres for Carteret were adjusted to this amount. In the winter of 2022 – 2023, Pamlico County undertook a pilot project to inspect older water control structures no longer under active maintenance agreements for functionality and water quality management. Over 300 water control structures were inspected as part of this project. The acres of drainage impacted by structures that were found to be functional and actively managed for water quality benefits were re-calculated by Pamlico SWCD staff and added back into BMP totals in Pamlico's CY2022 county data report. Those totals have carried over to Pamlico's reported water control structure affected acre totals for CY2023.

The water control structure reporting change from cumulative affected acres to active contract affected acres began in CY2019. Members of each LAC in coastal counties were notified in Fall

2019 that inactive contract acres, starting in CY2019 and moving forward, would no longer be included in BMP totals until older structures were inspected and determined to be appropriately managed and operational, or until the producer signed a new cost share contract. Several Districts indicated an interest and willingness in re-engaging with cooperators who have older structures. The Pamlico pilot project was instrumental in setting up a clear path for re-adding older structures into county BMP totals for nitrogen reduction credit with confidence.

The removal of inactive contract BMP acres from annual reports has resulted in a smaller nitrogen loss reduction in CY2023 in coastal counties (primarily Carteret, Craven, Jones, Lenoir, Pamlico, Pitt, and Wayne). It is important to note that this abrupt reduction, first seen in the CY2019 report, is primarily based on a methodological change and not on farmer behavior or BMP functionality. The BOC expects that there remains acreage not captured in this report that is impacted by functioning, controlled drainage practices that are managed for water quality benefits. The methodology change and the newly established pathway to re-add acreage affected by structures no longer under state/federal contract to county BMP totals ensures counties continue ongoing engagement with cooperators on structure management for water quality benefits. Due to ever-present demand, increased prioritization and implementation of water control structure contracts is still evident in many of these counties, and the BOC expects this trend to continue as precipitation patterns change.

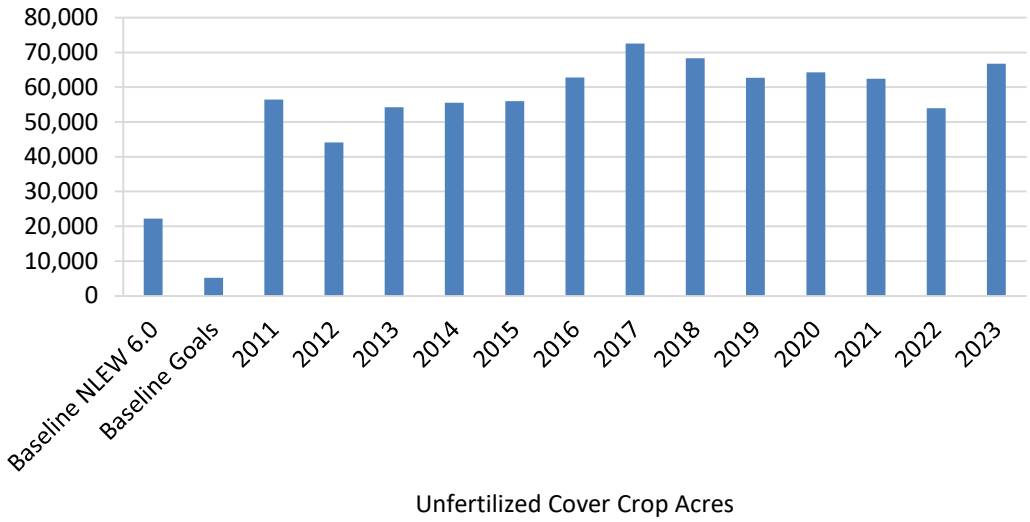
Figure 2. Acres Affected by Water Control Structures for Baseline (1991-1995) and Installed from CY2011 to CY2023, Neuse River Basin



The Division of Soil and Water Conservation, Soil and Water Conservation Districts and Natural Resources Conservation Service staff continue to make refinements to the county data reporting process as opportunities arise. LAC members estimate annual unfertilized cover crop acres based on crop rotations, producer cropping history, state and federal incentive programs, weather patterns, and seed prices. Buffer and water control structure BMP data is collected from state and federal cost share program active contracts, and in some cases from local partners with knowledge on BMP implementation that occurred without state or federal cost share funding support. While there is some opportunity for variability in the data reported,

LACs include data that is the best information currently available. As additional sound data sources become available, the LACs and the BOC will review these sources and update reporting methodology if warranted. As illustrated in Figure 3, CY2023 BMP implementation yielded a net increase of 12,798 unfertilized cover crop acres.

Figure 3. Unfertilized Cover Crop Acres Planted Annually on Agricultural Lands for Baseline (1991-1995) and Installed from CY2011 through CY2023, Neuse River Basin



An accurate reassessment of active agricultural land and remaining buffer systems, through GIS analysis or other tools, is needed due to the rate at which urbanizing counties have lost agricultural land. Such assessments will depend on data availability from state and federal agencies. The BOC is considering the feasibility of such assessments for future reporting.

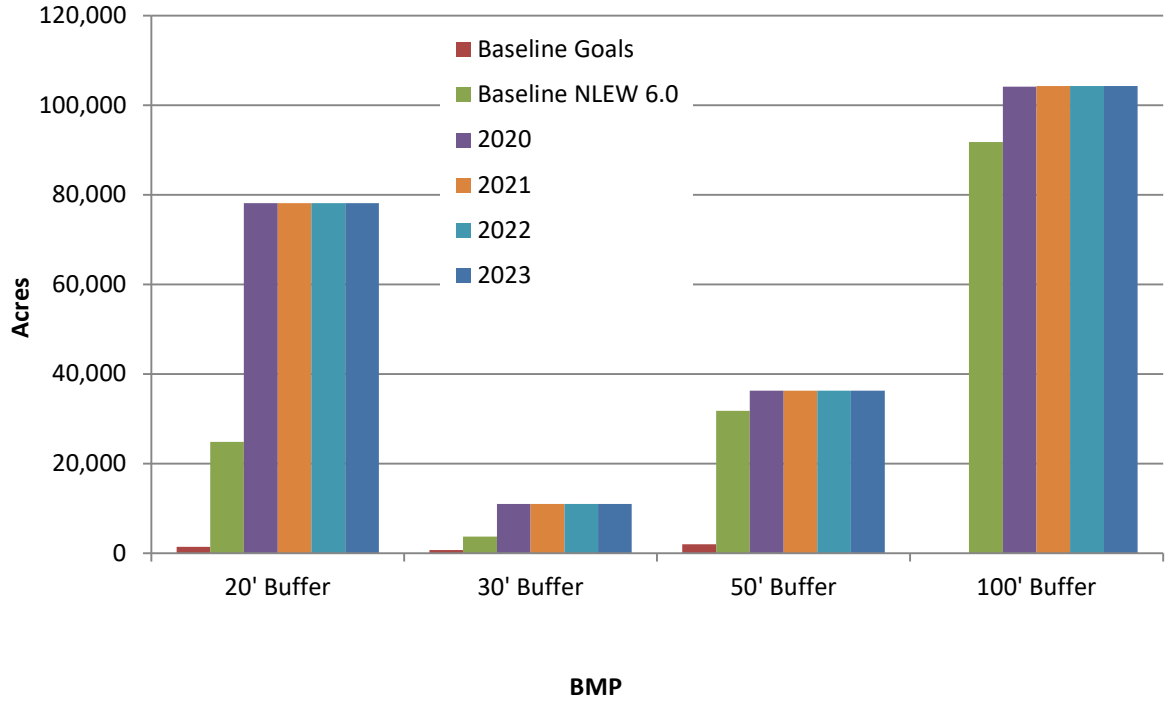
Based on the comparison of total cropland acres and state or federal cost share program BMPs, it is estimated that nearly half of the Neuse River Basin's cropland receives treatment from NLEW reported nitrogen-reducing BMPs.[4] This does not include farmer-installed BMPs that are not funded by cost share programs except in some cases where District staff are made aware of work that has been completed and shared that information. Additionally, the estimated acres do not take into account the entire drainage area treated by buffers in the piedmont, which is generally 5 to 10 times higher than the actual acres of the buffer shown in Figure 4.[5] Overall, the total acres of implementation of BMPs have increased since the baseline, as illustrated in Figures 2, 3 and 4. The BMP installation goals were set by the local nitrogen reduction strategy, which was approved by the EMC in 1999. Agriculture exceeded all installation goals in CY2008.

[4] Osmond, D.L., K. Neas. 2011. Delineating Agriculture in the Neuse River Basin. Prepared for NC Department of Environment and Natural Resources (NCDENR), Division of Water Quality. http://content.ces.ncsu.edu/delineating-agriculture-in-the-neuse-river-basin

[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. http://www.lib.ncsu.edu/theses/available/etd-03282004-174056/

As shown in Figure 4, two additional acres of 20-foot buffer, 19 acres of 30-foot buffer, and 5 acres of 100-foot buffer were implemented in CY2023.

*Figure 4. Buffer Acres Present on Agricultural Lands for Baseline (1991) and Installed from CY2020 through CY2023, Neuse River Basin**



**The acres of buffers listed represent actual acres. Acres affected by the buffer could be 5 to 10 times larger in the piedmont than the acreage shown above.* [6]

[6] Bruton, 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. http://www.lib.ncsu.edu/theses/available/etd-03282004-174056/

Additional Nutrient BMPs

Not all types of nutrient-reducing BMPs are tracked by NLEW. These 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 a nitrogen reduction benefit credit. The BOC believes it is worthwhile to recognize these practices. Table 4 identifies BMPs not accounted for in NLEW and tracks their implementation in the basin since CY1996. Table 5 indicates the total number of BMPs not accounted for in NLEW, which are under active contract approximated by a 10-year rolling window (CY2013 to CY2023).

Since baseline, increased implementation numbers are evident across all BMP types. Most of the additional nutrient-reducing BMPs (which are listed in Tables 4 and 5) experienced implementation increases in CY2023. Some of these BMPs will yield reductions in nitrogen loss that are not reflected in the NLEW accounting in this report but will benefit the estuary.

*Table 4. Nutrient-Reducing Best Management Practices Not Accounted for in NLEW, CY1996 to CY2023, Neuse River Basin**

BMP	Units	1996-2021	2022	2023
Diversion	Feet	194,589	198,490	204,470
Fencing (USDA programs)	Feet	249,393	269,293	274,576
Field Border	Acres	5,951	5,957	5,957
Grassed Waterway	Acres	2,507	2,533	2,550
Livestock Exclusion	Feet	154,299	155,354	157,954
Precision Agriculture	Acres	20,849	25,226	26,926
Sod Based Rotation	Acres	138,243	140,732	143,946
Tillage Management	Acres	66,667	67,273	68,185
Terraces	Feet	80,443	80,443	80,443

** Cumulative data quantified by adding BMPs implemented with State and Federal cost share program funding each Crop Year to cumulative totals reported the previous Crop Year. Additional BMPs may exist in the basin as practices may be installed by farmers without cost share assistance.*

*Table 5. Nutrient-Reducing Best Management Practices installed from CY2013 to CY2023, Not Accounted for in NLEW**

BMP	Units	BMPs Installed (CY2013 – CY2023)
Diversion	Feet	43,815
Fencing (USDA programs)	Feet	104,075
Field Border	Acres	746
Grassed Waterway	Acres	250
Livestock Exclusion	Feet	57,094
Precision Agriculture	Acres	24,359
Sod Based Rotation	Acres	47,457
Tillage Management	Acres	19,536
Terraces	Feet	29,773

** Values represent only active contracts in State and Federal cost share programs approximated by a 10-year rolling window. Additional BMPs may exist in the basin as producers may maintain practices after the life of a cost share contract. Practices installed by producers without cost share assistance are not included in BMP totals.*

Fertilization Management

Better nutrient management in the Neuse River has resulted in a reduction of fertilizer application rates from baseline levels. Despite annual fluctuations, fertilization rates for most major crops in the basin have been reduced from the baseline period.

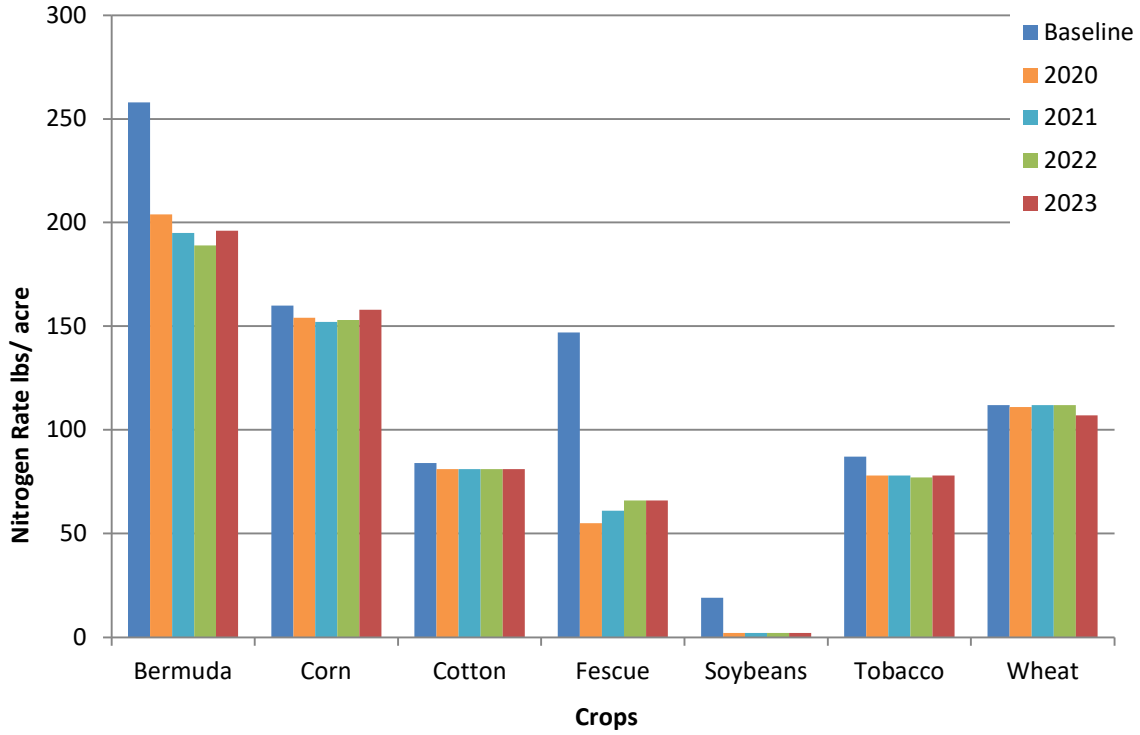
Factors Identified by LACs Contributing to Reduced Nitrogen Application Rates

- Economic decisions and fluctuating farm incomes
- Increased education and outreach on nutrient management
- Mandatory animal waste management plans
- The federal government tobacco quota buy-out reducing tobacco acreage
- Neuse and Tar-Pamlico Nutrient Strategies

Between CY2022 and CY2023 nitrogen application rates remained relatively stable (5 lbs/acre fluctuations or less) for corn, cotton, fescue, tobacco, soybeans, and wheat. Application rates on bermuda increased by 7 lbs/acre. Figure 5 below displays application rate changes from CY2020 to CY2023.

Over time there has been an economic incentive for producers to improve nitrogen management. Fertilizer rates and standard application practices are revisited annually by LACs using data from farmers, commercial applicators and state and federal agencies' professional estimates.

Figure 5. Average Annual Nitrogen Fertilization Rate (lbs/ac) for Agricultural Crops for the baseline (1991-1995) and 2020-2023, Neuse River Basin

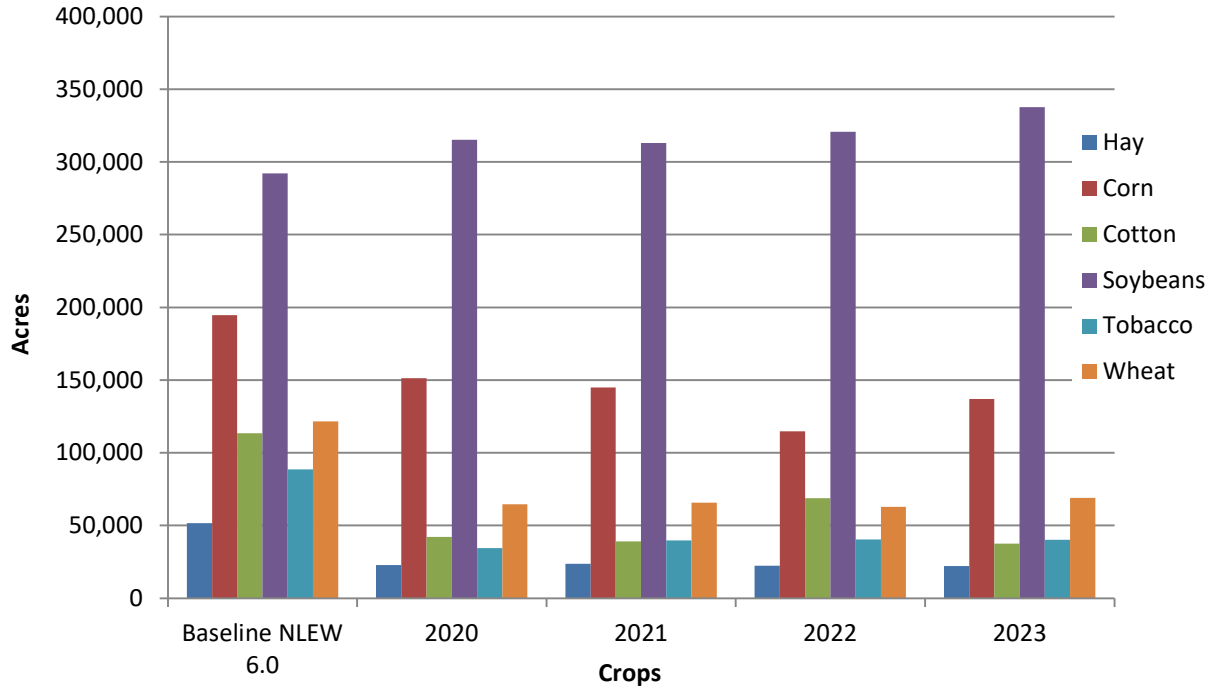


Cropping Shifts

LACs calculate cropland acreage annually by utilizing crop data reported by farmers to the Farm Service Agency. In 2024, the Division of Soil and Water Conservation was successful in requesting georeferenced Farm Service Agency cropland data for the first time in the history of annual reporting for the Neuse Basin. Georeferenced cropland data provides better field estimations of commodities grown in individual counties and within the entire Neuse basin. Because each crop type requires different amounts of nitrogen and utilizes applied nitrogen with a different efficiency rate, changes in the mix of crops grown can have significant impact on the cumulative yearly nitrogen loss reduction. Beyond cropping shifts expected due to possession of better geospatial commodity data in the basin, the BOC anticipates that the basin will see additional crop shifts in the upcoming year based on changing commodity prices and weather patterns.

Corn requires higher nitrogen application rates than other crops. From CY2022 to CY2023, corn acres increased by 22,067 acres. Cotton acreage decreased in CY2023 from CY2022 by 31,252 acres. Soybean acres, which require no nitrogen input, increased by 17,028 acres between CY2022 and CY2023 and wheat acres, many of which are planted in a double-crop rotation with soybeans, increased by 6,143 acres. Tobacco acres decreased by 228 acres between CY2022 and CY2023. These cropping shifts were likely primarily responsible for the increase in overall total nitrogen loss in CY2023 from CY2022 totals. Total nitrogen loss in CY2023 is nearly 24,209,000 pounds less than total nitrogen loss in baseline (1991-1995). A host of factors from individual choice to global markets determine crop selection. Figure 6 below displays acreage changes for major crops from CY2020 to CY2023.

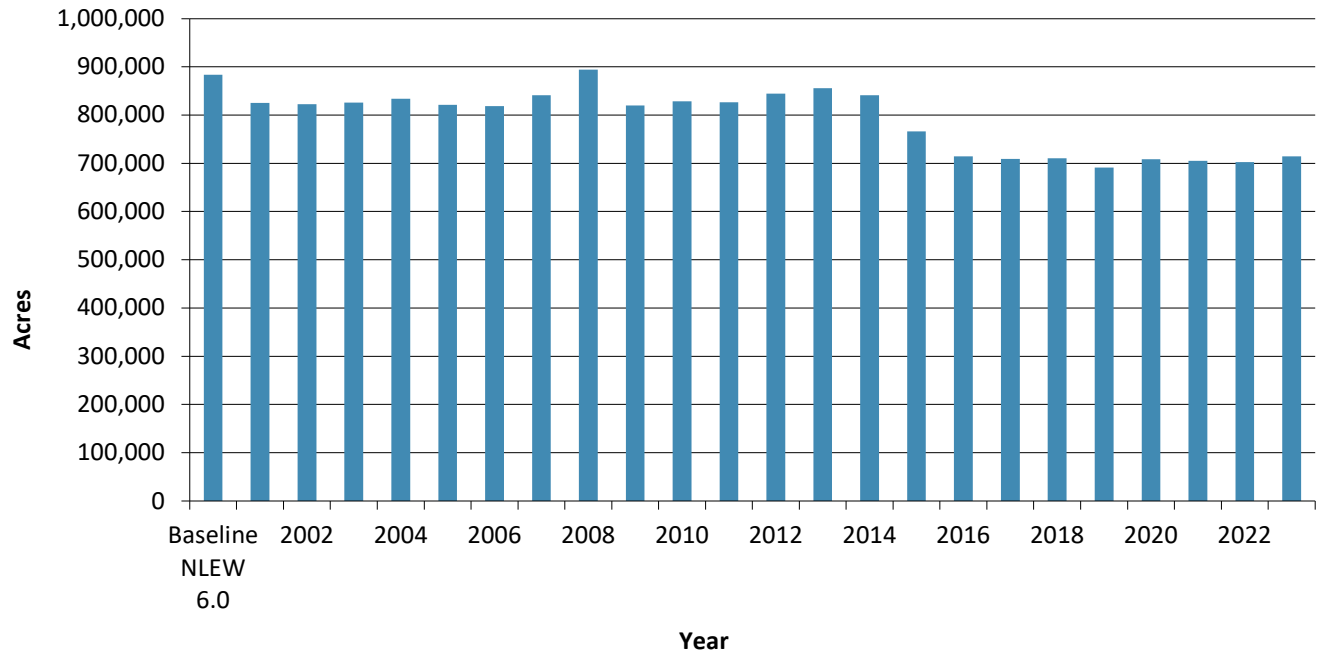
Figure 6. Acreage of Major Crops for the Baseline (1991-1995) and 2020-2023, Neuse River Basin



Land Use Change to Development, Idle Land and Cropland Conversion

The number of cropland acres fluctuates every year in the Neuse River Basin. Each year, some cropland is permanently lost to development or converted to grass or trees, while some cropland is temporarily taken out of production. Idle land represents agricultural land that is currently out of production but could be brought back into production at any time. Cropland conversion and cropland lost to development represents land taken out of agricultural production that is unlikely to be returned to production. It is estimated that more than 81,000 agricultural land acres in the Neuse basin have been lost to development since baseline, although this metric has not been updated since CY2017 due to incomplete data and reporting inconsistencies among local governments in the basin. Cropland conversion totals supported by state or federal cost-share funds are tracked and updated annually and currently 25,078 acres have been converted to grass or trees in the Neuse Basin since baseline (1991 – 1995). In CY2023 there were 71,467 idle acres reported and a total of 714,212 NLEW-accountable crop acres reported. These estimates come from the LAC members' best professional judgment, USDA-FSA records and county planning departments. Cropland acres have continued to decrease from the baseline period (see Figure 7).

Figure 7. Total NLEW Accounted Crop Acres in the Neuse River Basin, Baseline (1991-1995) and 2001-2023



Looking Forward

The Neuse BOC will continue to report on rule implementation, relying heavily on Soil and Water Conservation District staff to compile crop reports. The BOC continues to encourage counties to implement additional BMPs to further reduce nitrogen loss.

Because cropping shifts are susceptible to various pressures, the BOC is working with LACs in all counties to continue BMP implementation that provides lasting reduction in nitrogen loss in the basin.

The Neuse BOC 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.

Basin Oversight Committee recognizes the dynamic nature of agricultural business.

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

Funding

Ongoing agriculture rule reporting has incorporated data processing efficiencies and improvements since reporting began. NLEW upgrades have allowed LAC members to more actively participate in the compilation of data and analysis of nitrogen loss trends, and the Division of Soil and Water Conservation's digital contracting system has helped optimize BMP documentation efforts.

In CY2023, Soil and Water Conservation Districts spent over $805,000 through the Agriculture Cost Share Program in the Neuse River Basin using recurring state appropriated funds and non-recurring disaster relief funds for BMP implementation. The Natural Resources Conservation Service spent almost $1,920,000 through the Environmental Quality Incentives Program in the counties located in the Neuse River Basin. These programs have all helped fund erosion and nutrient-reducing BMPs in the Neuse Basin.

Sufficient funding for technical assistance and BMP implementation incentivization is indispensable for continued achievement and maintenance of agricultural nitrogen reduction goals. Local demand for funding, to support experienced staff versed in conservation planning and cost-share program implementation in addition to supporting adoption of water-quality improving BMPs, far outstrips existing resources. In FY2025, Soil and Water Conservation Districts lying within the Neuse Basin requested almost 5 times more Agriculture Cost Share Program funding than was available for the fiscal year's allocation. Funding of state and federal cost share programs is essential for continued progress in reducing nitrogen losses from agricultural land.

Each year, 150 LAC members contribute to agriculture rule reporting to ensure accurate documentation of agricultural acres and fertilization rates. Farmers and agency staff with other responsibilities serve on the LACs in a voluntary capacity. Basin Oversight Committee members meet at least once per year to review and approve this annual progress report, which includes time spent outside of that annual meeting to review draft documents and approve methodology changes. Participation by so many members of the local agricultural community demonstrates a commitment toward achieving the nutrient strategy's long-term goals.

Funding to support agricultural data collection and annual reporting is critical. In the early years of Neuse Agriculture Rule reporting, grant funding supported technicians and basin coordinators at Soil and Water Conservation Districts to assist with BMP implementation and reporting requirements. At present there is no funding for full-time Neuse Basin coordinators or technicians. The Division of Soil and Water Conservation expends approximately $90,000 on agricultural reporting staff support annually, using funds received through an EPA 319(h) grant administered by the Department of Environmental Quality. Consequently, in addition to other duties, the NCDA&CS Division of Soil and Water Conservation Nonpoint Source Planning Coordinator was assigned the data collection, compilation and reporting duties for the Neuse Agriculture Rule and for all other basins and watersheds subject to existing Nutrient Sensitive Waters Strategies and Agriculture Rules. Responsibility for compilation and review of annual local progress reports for the Neuse Basin also now largely falls on LACs and Soil and Water Conservation District staff. Few currently serving LAC members were active during the stakeholder process for the Agriculture Rule, so some institutional knowledge about annual reporting requirements has been lost. As a result, training new Soil and Water Conservation District staff and LAC members regarding rule requirements and reporting is necessary and ongoing.

Reductions in funding and staffing necessitate a more centralized approach for collection and verification of agricultural data included in annual progress reports. This evolving approach may involve developing additional GIS analysis tools and streamlining FSA acreage documentation. New tools will be vetted by the BOC and may be incorporated into the agriculture rule accounting methodology. As methods change, LACs will be trained to handle the changing workloads to the best of their ability. Because most District staff have neither the time nor financial resources to synthesize county level data, centralized collection approaches will 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. Due to eligibility changes and other funding constraints, new data can only be developed intermittently. Prior funding sources for such research, which provided much of the scientific information on which NLEW was based, are no longer available. As new funding is made available, additional North Carolina-specific research information will be considered for incorporation into future NLEW updates. The NLEW software (v6.0) is currently configured to pull revised realistic yield and nitrogen use efficiency data from the North Carolina Realistic Yield Database, which is intermittently updated when new research becomes available.

Conclusion

Significant progress has been made in agricultural nitrogen loss reduction, and the agricultural community in the Neuse Basin consistently reaches its 30% reduction goal. However, the measurable effects of management changes and conservation practice implementation 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 annual summary of agricultural reductions reflect “edge-of-management unit” calculations that contribute to achieving the overall 30% nitrogen loss reduction goal. Significant quantities of agricultural BMPs have been installed since the adoption and implementation of the Neuse Nutrient Management Strategy, and agriculture continues to fulfill its obligations toward achieving the collective goal of a 30% reduction of nitrogen delivered to the Neuse estuary.