

**Annual Progress Report on the Tar-Pamlico Agricultural Rule
(15 A NCAC 02B.0256)
A Report to the NC Environmental Management Commission
From the Tar-Pamlico Basin Oversight Committee
Crop Year 2009**

Summary

The Tar-Pamlico Basin Oversight Committee (BOC) received and approved crop year (CY) 2009 annual reports from the fourteen Local Advisory Committees (LACs) operating under the Tar-Pamlico Agricultural rule as part of the Tar-Pamlico Basin Nutrient Management Strategy. The reports demonstrate ongoing collective compliance and estimate further agriculture progress in decreasing nutrient losses. Agriculture collectively achieved an estimated 50% reduction in nitrogen loss compared to the 1991 baseline, continuing to exceed the rule-mandated 30% reduction. This represents the same reduction compared to the 50% reduction reported in CY2008. All fourteen LACs exceeded the mandated 30% reduction goal.

Rule Requirements and Compliance History

Effective September 2001, the Tar-Pamlico Nutrient Sensitive Waters Management Strategy (NSW) provides for a collective strategy for farmers to meet the 30% nitrogen loss reduction and no-increase phosphorus goals within five years. A BOC and fourteen LACs were established to implement the rule and to assist farmers with complying with the rule. Currently there are five full time technicians that work with LACs to coordinate information for the annual reports. They are funded by the EPA 319 grant program, NC Agriculture Cost Share Program (ACSP) technical assistance funds, county funds and USDA-Natural Resources Conservation Service (NRCS) funds.

Tar-Pamlico NSW Strategy

The Environmental Management Commission (EMC) adopted the Tar-Pamlico nutrient strategy in 2000. The NSW strategy goal is to reduce the average annual load of nitrogen to the Pamlico estuary by 30% from 1991 levels and to limit phosphorus loading to 1991 levels. Mandatory controls were applied to addressing non-point source pollution in agriculture, urban stormwater, nutrient management, and riparian buffer protection. The management strategy built upon the precedent-setting Neuse River Basin effort established three years earlier, which for the first time, set regulatory reduction measures for nutrients on cropland acres in the state.

All fourteen LACs submitted their first annual report to the BOC in November 2003, which collectively estimated a 34% nitrogen loss reduction, and 10 of 14 LACs exceeding the 30% individually. Collective reductions have gradually increased in succeeding years, and by CY2007 only one LAC was shy of the 30% individually. In CY2008 all LACs exceeded the 30% nitrogen loss reduction goal and have continued to meet the goal in CY2009.

Scope of Report

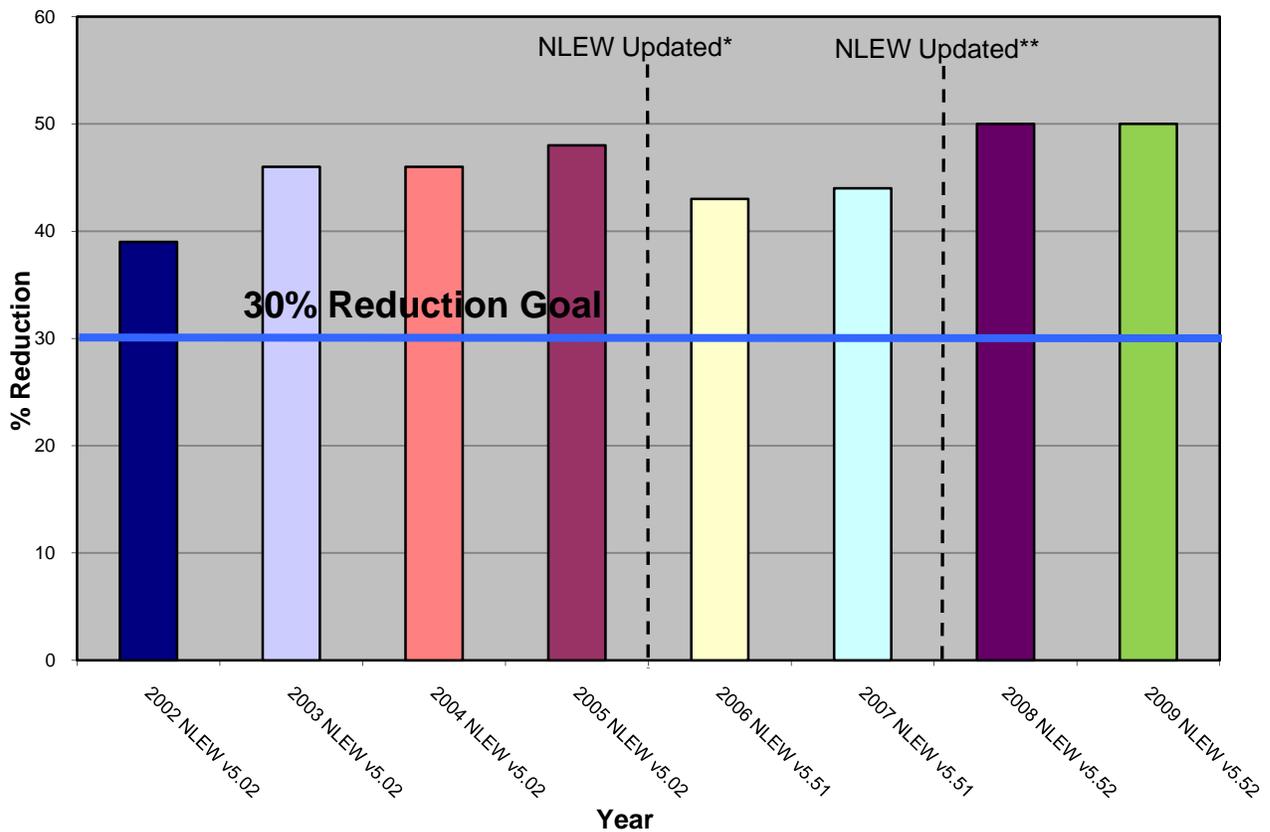
The estimates provided in this report represent whole-county scale calculations of nitrogen loss from cropland agriculture in the basin made by soil and water conservation district technicians using the 'aggregate' version of the Nitrogen Loss Estimation Worksheet, or NLEW, an accounting tool developed to meet the specifications of the Neuse Rule. The development team included interagency technical representatives of the NC Division of Water Quality (DWQ), NC Division of

Soil and Water Conservation (DSWC), USDA-NRCS and was led by NC State University Soil Science Department faculty. NLEW captures application of both inorganic and animal waste sources of fertilizer to cropland. It does not capture the effects of managed livestock on nitrogen movement, including pastured, confined, and non-commercial livestock. 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.

Effect of NLEW Refinements on Annual Estimates

The NLEW software has been revised to incorporate improvements prior to reports being completed for CY2006 and CY2008. These changes have incorporated the best available data, but considerations must be made when comparing nitrogen reduction loss in different versions of NLEW. Further updates in soil management units are expected as NRCS produces updated electronic soil data. The small changes in soil management units are unlikely to produce significant effects on nitrogen loss reductions. Other updates may be made as further data on BMP efficiencies becomes available. Figure 1 represents the percent nitrogen loss reduction from 2002 to 2009.

Figure 1. Collective Nitrogen Loss Reduction Percent 2002 to 2009, Tar Pamlico River Basin.



*Between CY2005 & CY2006 NLEW was updated to incorporate revised soil management units and buffer nitrogen reduction efficiencies were reduced.

**Between CY2007 & CY2008 NLEW was updated to incorporate revised soil management units and correct some realistic yield errors.

The first revision marked a significant change in the nitrogen reduction efficiencies of buffers so both the baseline and CY2005 were re-calculated based on the best available information. The

second revision was a minor update of soil mapping units; the baseline was not recalculated because the effect on the percent nitrogen loss reduction was minimal.

Current Status

Nitrogen Reduction from Baseline for CY2009

All fourteen LACs submitted their eighth annual report to the BOC in August 2010. For the entire basin, in CY2009 agriculture achieved a 50% reduction in nitrogen loss compared to the 1991 baseline. This is the same reduction as compared to the 50% nitrogen loss reduction in CY2008. This year all of the LACs achieved at least the 30% nitrogen loss reduction goal individually. Table 1 lists each county's baseline, CY2008 and CY2009 nitrogen (lbs/yr) loss values, along with nitrogen loss percent reductions from the baseline in CY2008 and CY2009.

Table 1. Estimated Reductions in Agricultural Nitrogen Loss from Baseline (1991) for CY2008 (NLEW v5.52) and CY2009 (NLEW v5.52), Tar-Pamlico River Basin

County	Baseline N Loss (lb)* NLEW v5.51	CY2008 N Loss (lb)* NLEW v5.52	2008 Reported N Loss (%) NLEW v5.52	CY2009 N Loss (lb)* NLEW v5.52	2009 Reported N Loss (%) NLEW v5.52
Beaufort	8,811,875	5,250,556	40%	4,944,627	44%
Edgecombe	5,103,502	3,184,038	38%	3,332,444	35%
Franklin	1,993,925	608,444	70%	639,206	68%
Granville	971,365	327,732	66%	344,791	65%
Halifax	2,819,301	1,353,174	52%	1,449,612	49%
Hyde	4,861,387	2,467,446	49%	2,850,975	41%
Martin	825,278	519,639	37%	485,331	41%
Nash	4,658,164	1,849,268	60%	1,488,684	68%
Person	168,038	82,718	51%	82,829	51%
Pitt	5,966,245	2,543,638	57%	2,650,499	56%
Vance	449,753	119,419	73%	107,094	76%
Warren	610,045	251,631	59%	116,501	81%
Washington	898,346	508,937	43%	487,115	46%
Wilson	780,741	413,294	47%	379,478	51%
Total	38,917,965	19,479,934	50%	19,359,186	50%

**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.*

Nitrogen loss reductions were achieved through the combination of fertilization rate decreases, cropping shifts, BMP implementation and cropland attenuation shown in Table 2. The most significant factor continues to be fertilization management. NLEW estimates these factors contributed to the total nitrogen loss reduction in the following manner:

Table 2. Factors that Influence Nitrogen Reduction by Percentage on Agricultural Lands, Tar-Pamlico River Basin

	CY2006 NLEW v5.51	CY2007 NLEW V5.51	CY2008 NLEW V5.52	CY2009 NLEW V5.52
BMP implementation	8%	10%	10%	11%
Fertilization Management	20%	20%	21%	20%
Cropping shifts	7%	8%	10%	11%
Reduction in cropland due to idle land	4%	3%	4%	3.5%
Reduction in cropland due to cropland conversion	3%	2%	4%	3.5%
Reduction in cropland due to development	1%	1%	1%	1%
TOTAL	43%	44%	50%	50%

BMP Implementation

As illustrated in Figure 2, CY2009 yielded net increases in acres affected by water control structures, a decrease in nutrient scavenger crops, while acres of buffers held steady. The increase in water control structures was due to newly installed BMPs. A total of 23 water control structures effecting 840 acres were installed in CY2009.

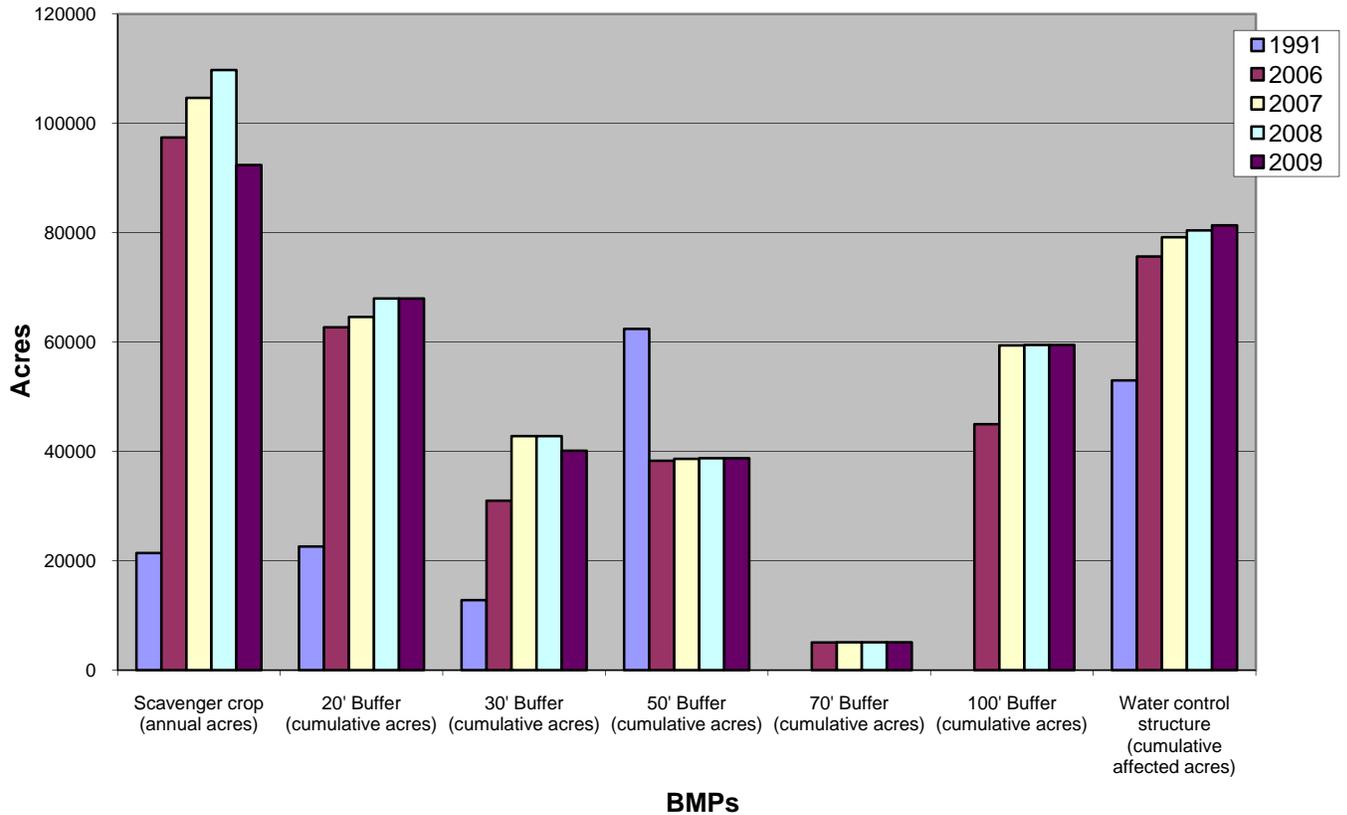
In CY2007 it became possible to search the USDA-Natural Resources Conservation Service (NRCS) database in addition to the NCACSP database for BMPs installed by hydrologic unit code. This allowed for better accounting for practices installed using federal cost share programs. BMP data is collected from state and federal cost share program active contracts, and in some cases BMPs that were installed without cost share funding. While there is the inherent opportunity for variability in the data reported, LACs are including data that is the best information currently available. As additional sound data sources become available, the LACs will review the sources and update their methodology for reporting if warranted.

From 2001 through 2006, the NLEW program captured buffers 50' and larger as one category; after the 2007 update, categories for 70' and 100' buffers were added. In CY2006 the buffers larger than 50' were redistributed into these new categories. If this redistribution had not occurred the 50' buffer acres would have been higher in subsequent years.

Overall, the rate of implementation of all BMPs has increased since the baseline, as illustrated in Figure 2. Based on a comparison of the actual acres of BMPs installed through federal, state and local cost share programs to total cropland acres; over half of all reported croplands receive some kind of treatment by BMPs. However this treatment estimate does not take into account the entire drainage area treated by buffers which is generally 5 to 10 times higher than the actual acres of the buffer shown in figure 2. (Bruton 2004)¹

¹ 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.

Figure 2: Nutrient Reducing BMPs installed on Agricultural Lands From Baseline (1991) to 2009, Tar-Pamlico River Basin*



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

Additional Nutrient BMPs

Not all types of nutrient-reducing BMPs are tracked by NLEW. These include: livestock-related nitrogen and phosphorus reducing BMPs and BMPs that reduce soil and phosphorus loss and BMPs that do not have scientific studies showing the exact nitrogen benefit. The BOC believes it is worthwhile to recognize these practices. Table 3 identifies BMPs not accounted for in NLEW and tracks their implementation in the Basin since CY2005.

Increases are evident in CY2009 across all BMP types with the exception of sod-based rotation. Several practices increased due to the ability to query federal cost share databases by hydrologic unit code and additional NCACSP funds provided by the Drought Response Assistance Program. The federal information was not included prior to CY2007. These BMPs will yield reductions in nitrogen loss that are not reflected in the NLEW accounting in this report but will benefit the estuary.

In 2007, to assist farmers impacted by the record drought affecting much of North Carolina, the DSWC launched an agricultural drought response project. The Soil and Water Conservation Commission earmarked a portion of the ACSP toward this project, and the Division received additional funding support through the Council of State Emergency Fund, the Tobacco Trust Fund Commission, and the General Assembly. Farmers could receive cost share assistance to restore pastures that were damaged by the drought, to drill new water supply wells for livestock or irrigation, to remove sediment accumulation from water supply ponds, and to convert to more efficient irrigation methods. The Soil and Water Conservation Commission required any applicant receiving funds for wells or ponds for pasture-based livestock watering to exclude livestock from streams and ponds. This resulted in a significant increase in BMP implementation to protect streams.

Table 3: Nutrient-Reducing Best Management Practices Not Accounted for In NLEW, 2005-2009, Tar-Pamlico River Basin*

BMP	Units	2001	2006	2007	2008	2009
Diversion	Feet	176,797	350,456	359,656	388,920	389,861
Fencing (USDA Programs)	Feet	na	na	na	129,498	205,959
Field Border	Acres	118	270	420	471	539
Grassed Waterway	Acres	314	553	595	639	646
Livestock Exclusion	Feet	21,662	80,589	87,804	217,302	217,302
Sod Based Rotation	Acres	1,337	4,051	6,783	17,847	16,724
Tillage Management	Acres	936	4,107	23,568	31,421	33,905
Terraces	Feet	206,560	444,394	350,686	352,819	368,914

*Values represent active contracts in State and Federal cost share programs. The federal information was not included prior to CY2007.

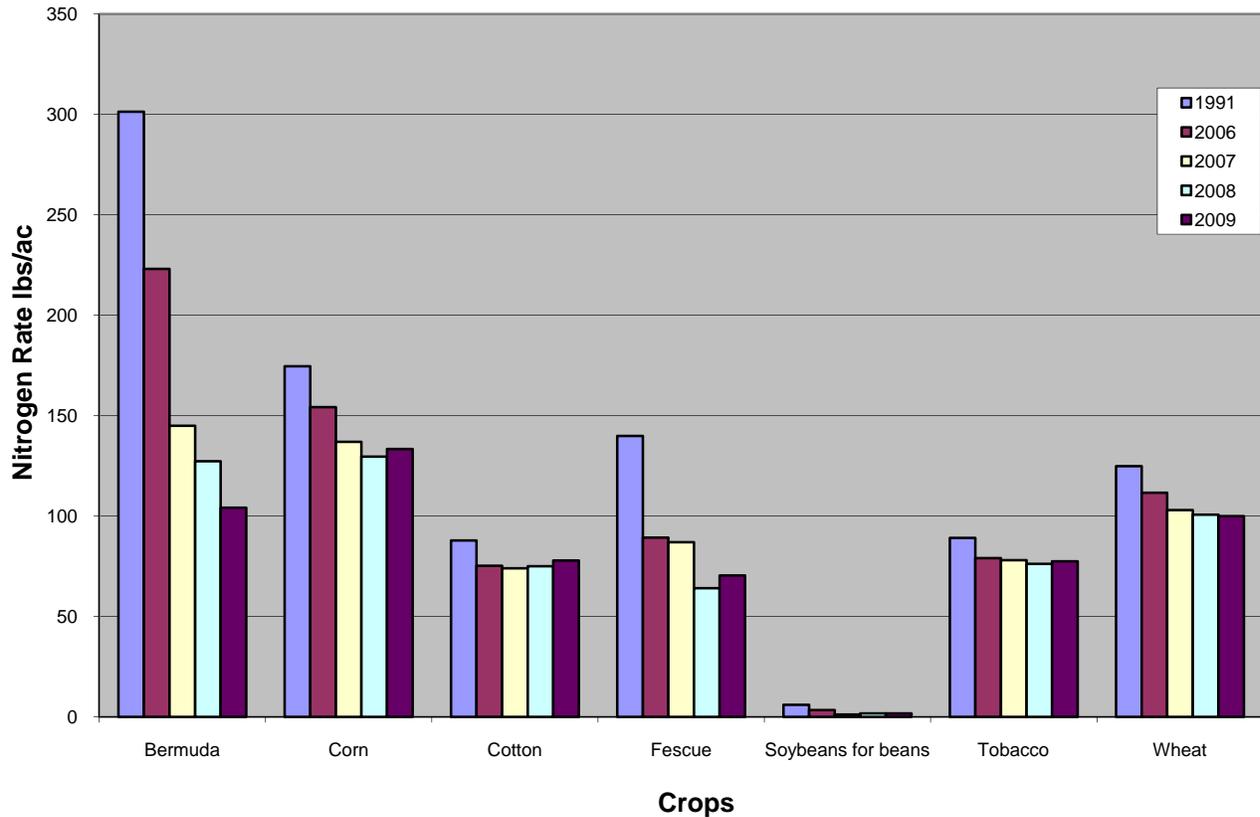
Fertilization Management

Both increased fertilizer cost and better nutrient management has resulted in farmers in the Tar-Pamlico River Basin reducing their nitrogen application from baseline levels. Figure 3 indicates that nitrogen rates for the major crops in the basin have reduced from the baseline period. In CY2009 nitrogen rates increased for corn, cotton, tobacco and fescue compared to CY2008, while the rates for bermuda and wheat slightly decreased. Most pastures are under fertilized throughout the Tar-Pamlico basin. Some bermuda and fescue land is used for waste application, but due to the nitrogen concentrations of the waste and the amount of liquid, actual waste applied does not have nitrogen applications rates as high as the agronomic rates for the grasses. The pasture and hayland are typically not supplemented with inorganic fertilizers. Fertilizer rates are revisited annually by LACs using data from farmers, commercial applicators and state and federal agencies’ professional estimates.

Factors Identified By LACs Contributing To Reduced Nitrogen Rates

- Rising fertilizer costs and dwindling farm incomes.
- Increased education & outreach on nutrient management (NC Cooperative Extension holds an annual nutrient management training session, since 2004 approximately 2,000 farmers and applicators have received training.)
- Mandatory waste management plans
- The federal government tobacco quota buy-out reducing tobacco acreage.
- Neuse & Tar-Pamlico Nutrient Strategies.

Figure 3. Average Annual Nitrogen Fertilization Rate (lb/ac) for Agricultural Crops for the Baseline (1991) and 2006-2009, Tar-Pamlico River Basin

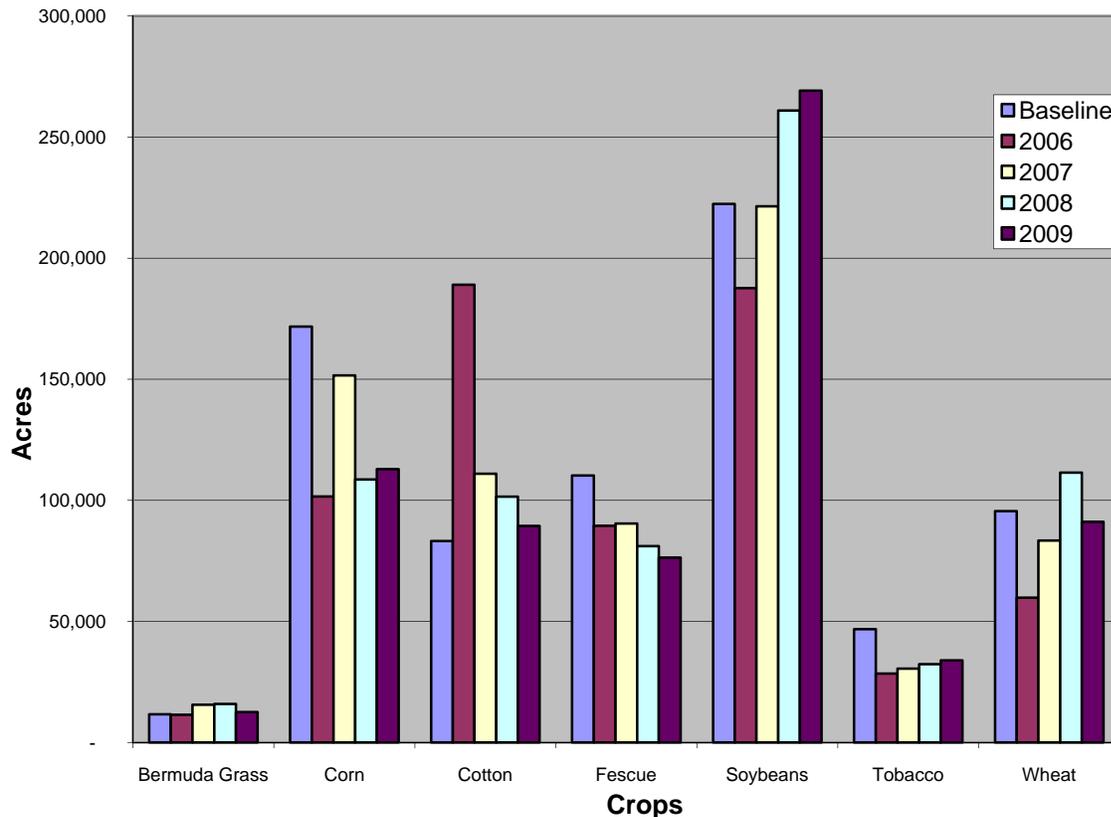


Cropping Shifts

The LACs calculated the cropland acreage by utilizing crop data reported by farmers to the USDA-Farm Service Agency. Each crop requires different amounts of nitrogen and use the nitrogen applied with different efficiency rates. Changes in the mix of crops grown can have a significant impact on the cumulative yearly nitrogen loss reduction.

Figure 4 shows crop acres and shifts for the last four years compared to the baseline. While some crops – bermuda, fescue and tobacco – have remained relatively stable, others show more volatility. A host of factors from individual to global determine crop choices. One economic trend from the mid-90's through the early years of 2000 was the corn-to-cotton shift. This shift changed due to market conditions in CY2007. The future of this trend is uncertain as market forces play out. Crop acreages are expected to fluctuate with the market yearly.

Figure 4. Acreage of Major Crops for the Baseline (1991) and 2006-2009, Tar-Pamlico River Basin

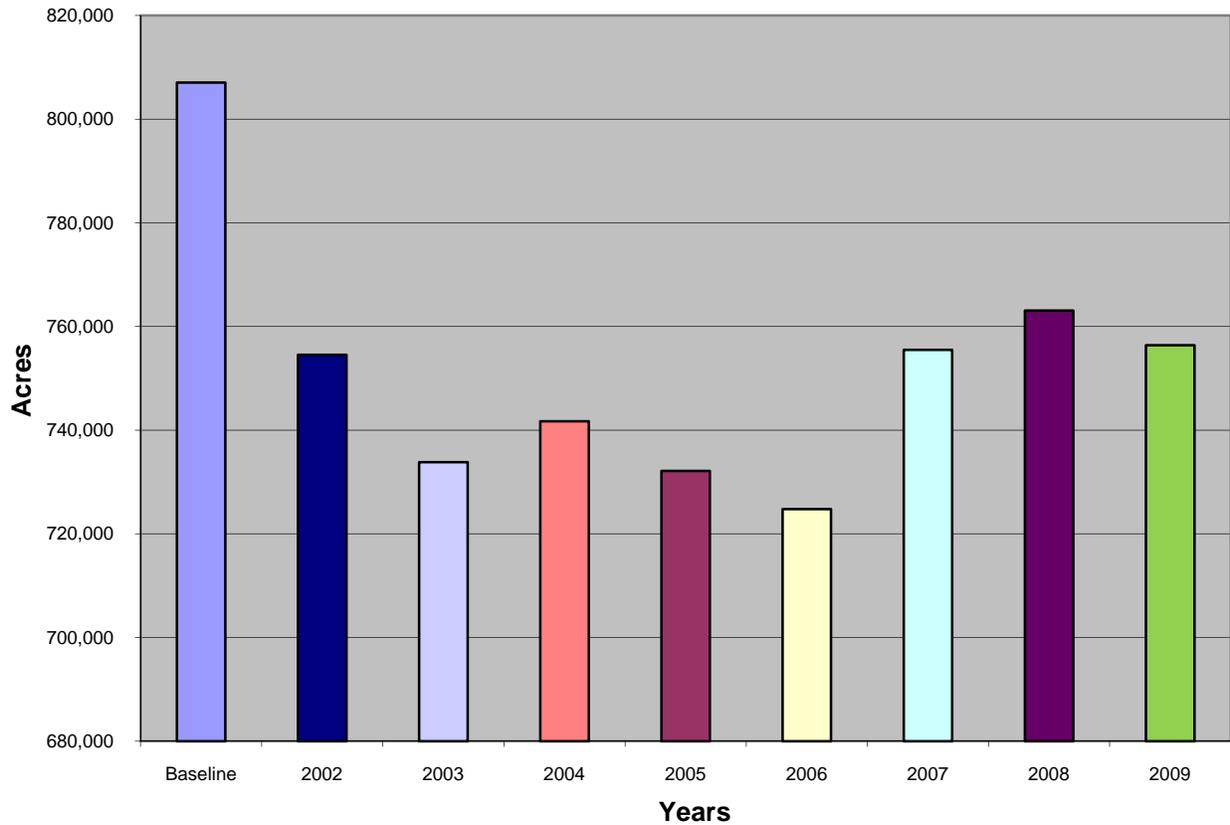


Land Use Change to Development, Idle Land and Cropland Conversion

The number of cropland acres fluctuates every year in the Tar-Pamlico River Basin due to cropland conversion, idle land and development. Each year, some cropland is permanently lost to development or converted to grass or trees and likely to be ultimately lost from agricultural production. Idle land is agricultural land that is currently out of production but could be brought back into production at any time. Currently it is estimated that approximately 10,000 acres have been permanently lost to development and more than 31,000 acres have been converted to grass or trees since the baseline. For CY2009 it is estimated that there are an additional approximate 32,000 idle acres and a total of 733,323 acres of cropland. These estimates come from the LAC members' best professional judgment, USDA-FSA records and county planning department data.

The 2009 Neuse River Basin Action plan states the Division of Water Quality plans to reconvene the land accounting work group in 2009 (which last met in 2007). The Land Accounting Workgroup is comprised of DWQ and DSWC staff along with researchers from NC State and representatives with NC Farm Bureau and environmental stakeholders. The main objective is to develop recommendations for a comprehensive uniform land accounting framework to better track the conversion of agricultural land to other uses like development, conservation and mitigation projects. Lessons applied in the Neuse River Basin will be used to further refine Tar-Pamlico estimates. While this group did not meet in 2009, members of the BOC plan to participate with the land use accounting work group to better quantify land use changes in the basin when the group is reconvened.

Figure 5. Total Cropland Acres in the Tar-Pamlico River Basin, Baseline (1991) and 2002-2009



Phosphorus

Phosphorus Indicators for CY2009: The qualitative indicators included in Table 4 below show the relative changes in land use and management parameters and their relative effect on phosphorus loss risk in the basin. 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. Table 4 builds upon the data provided in the 2005 PTAC report, which included all available data at the time ending with data from 2003. This report adds phosphorus indicator data for CY2006, CY2007, CY2008 and CY2009. Most of the parameters indicate less risk of phosphorus loss than in the baseline.

Contributing to the reduced risk of phosphorus loss is the increase of nutrient reducing BMPs in the basin. As indicated in Table 4, the acres affected in the basin by vegetated buffers and water control structures have steadily increased over the past three years. It should also be noted that the soil test phosphorus median number

Phosphorous Technical Assistance Committee (PTAC)

The Phosphorus Technical Advisory Committee’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 is not currently 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. 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.

reported for the basin fluctuates each year due to the nature of how the data is collected and compiled. The soil test phosphorus median numbers shown in Table 4 are generated by using North Carolina Department of Agriculture and Consumer Services (NCDA&CS) soil test laboratory results from voluntary soil testing 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 basin, and have not been adjusted to include only those samples collected in the river basin area.

Table 4. Relative Changes in Land Use and Management Parameters and their Relative Effect on Phosphorus Loss Risk in the Tar-Pamlico Basin

Parameter	Units	Source	1991 Baseline	2006	2007	2008	2009	91-09 % Change	2009 P Loss Risk +/-
Agricultural land	Acres	FSA	807,026	724,778	755,489	763,066	756,365	-6.28%	-
Cropland conversion (to grass & trees)	Acres	USDA-NRCS & NCACSP	660	23,083	20,754	31,110	31,168	4712%	-
CRP / WRP (cumulative)	Acres	USDA-NRCS	19,241	30,768	34,614	38,375	38,967	%	-
Conservation tillage	Acres	USDA-NRCS & NCACSP	41,415	362,102	66,079	31,421*	33,905*	24%	+
Vegetated buffers (cumulative)	Acres	USDA-NRCS & NCACSP	50,836	195,673	210,488	214,043	211,360	421%	-
Water control structures (cumulative)	Acres Affected	USDA-NRCS & NCACSP	52,984	75,641	79,167	80,418	81,348	152%	-
Scavenger crop	Acres	LAC	13,272	97,405	120,565	109,741	92,376	827%	-
Animal waste P	lbs of P/yr	NC Ag Statsics	13,597,734	14,728,831	14,626,960	14,560,934**	14,608,377**	%	+
Soil test P median	mg/kg	NCDA&CS	83	85	89	89	84	%	+

* Conservation tillage is still being practiced on additional acres but this number only reflects active cost share contract acres, not acres where contracts have expired.

** Due to the reporting protocol of the National Agricultural Statistics Service some of the numbers were not available for 2009. The additional numbers were derived from the NCDA & CS Emergency Program. The PTAC will be reconvened before the next reporting cycle to approve a new methodology for obtaining the animal data.

Based on these findings, the BOC recommends that no additional management actions be required of agricultural operations in the basin at this time to comply with the “no net increase above the 1991 levels” phosphorus goal of the agriculture rule. The BOC will continue to track and report

the identified set of qualitative phosphorus indicators to the EMC annually, and to bring any concerns raised by the results of this effort to the EMC's attention as they arise, along with recommendations for any appropriate action. The BOC expects that BMP implementation will continue to increase throughout the basin in future years, and notes that BMPs installed for nitrogen, pathogen and sediment control often provide significant phosphorus benefits as well.

Rose Acres Farms

Rose Acre Farms received permit approval for 14 laying houses and 3 pullet houses with a total capacity of 4 million layers and 750,000 pullets in 2004. The facility has a current population of around 3.3 million layers according to the May 2010 NCDWQ permit inspection. Since this facility was permitted after the baseline was established for the Tar Pamlico Nutrient Sensitive Waters Strategy and its proximity to the Pocosin Lakes National Wildlife Refuge (PLNWR), special studies were conducted by NCDWQ and the U.S. Fish and Wildlife Service (USFW).

The results from the complete 5 year NCDWQ water quality study indicate higher nutrient concentrations after it became operational in 2006. The preliminary data from the USFW wet and dry deposition study indicates the facility is affecting air quality in the PLNWR. The study found increasing trends of wet and dry deposition of nitrogen indicative of local sources of emissions. The final report for the PLNWR study is expected in late 2011.

The BOC will continue to review data from all studies as they are completed and become available and will consider the results as they relate to land based sources and uses as was recommended by the 2004 NPDES permit application Hearing Officers Report. These reviews may lead to recommendations in the future annual reports.

Looking Forward

The Tar-Pamlico BOC will continue to improve rule implementation, relying heavily on the basin technicians to work with the LACs and farmers.

Basin Oversight Committee recognizes the dynamic nature of agricultural business.

- Changes in the world economies, energy or trade policies.
- Changes in government programs (i.e., commodity support or environmental regulations)
- Weather (i.e., long periods of drought or rain)
- Scientific advances in agronomics (i.e., production of new types of crops or improvements in crop sustainability)
- 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)

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

The 2009 Neuse River Action plan states the Division of Water Quality plans to reconvene the land accounting work group in 2009 to provide a more uniform manner to track land use changes. The BOC will work with DWQ to better quantify land use changes in the basin when they meet again.

Funding is an integral part in the success of this strategy. Without funding for the technicians, the annual progress reports and BMP installation responsibilities would fall on the LACs without

assistance to compile data and annual reports. Farmers and agency staff personnel with other responsibilities serve on the LACs in a voluntary capacity. If funding for technician positions is not available, the LACs would have a difficult time meeting the workload requirements.

In the Summer of 2010, the Division of Water Quality plans to release a draft of the Tar-Pamlico River Basinwide Water Quality Plan. The Basin Oversight Committee, the Division of Soil and Water Conservation and the local Soil and Water Conservation Districts will assist the Division of Water Quality as they complete the Tar-Pamlico River Basinwide Water Quality Plan later this year.