

**White Paper on the August 2006 Revisions to the Buffer Section of the draft Inland Bays  
Pollution Control Strategy and Proposed Regulations**

The Delaware Center for the Inland Bays Scientific and Technical Advisory Committee

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This paper characterizes the effectiveness of the buffer system of the August 2006 draft Pollution Control Strategy (PCS) to reduce nutrient loads to the Inland Bays. The intent of this paper is also to advise the Board of Directors of the Center for the Inland Bays (CIB), lawmakers, and the public on the components of a buffer system that can reduce the greatest nutrient loads and still allow for profitable conversion of land to development. This paper was developed partly from a discussion among a volunteer subcommittee meeting of scientists and resource managers of the CIB Scientific and Technical Advisory Committee (STAC) on September 15, 2006 (Table 1), and partly from a comparative GIS analysis of the May 2005 and August 2006 drafts of the PCS as prepared by Christopher Bason (CIB) available online at [http://www.inlandbays.org/cib\\_pm/pdfs/uploads/bufferstratreview.pdf](http://www.inlandbays.org/cib_pm/pdfs/uploads/bufferstratreview.pdf)

### **Riparian Buffers**

Riparian buffers are areas adjacent to waterbodies that provide valuable services including flood control, biodiversity, and nutrient retention. While buffers are best managed for all of their important services, the PCS, and thus this paper focus only on nutrient retention. The PCS addresses a number of components of a buffer system as listed in (Table 2). All of these components contribute to the capacity of a buffer to retain nutrients and should all be considered when discussing the effectiveness of a buffer system.

### **PCS Buffer Comparison**

The revised August '06 PCS buffer section differed substantially from that of the May 2005 draft in all its components. The May '05 draft proposed 100 foot buffers of primarily native forest along all wetlands, tidal waters, and intermittent and perennial waterways with few structural variances and was applicable to all subdivisions. The August '06 draft proposed a 50 foot buffer with no vegetation requirements along only tidal wetlands, tidal waters, and perennial streams and ditches with more structural variances and is applicable only to major subdivisions (Table 3).

To determine differences in buffer nutrient load reductions between PCS drafts, two subwatersheds representing different regions of the Inland Bays watershed were compared using GIS. The comparison only considered the application of buffers at a change in landuse and moderate assumptions about the intensity of development were used<sup>1</sup>. *On average, the nitrogen and phosphorus load reductions provided by the August 2006 draft were 98% less than those of the May 2005 draft. For example, in one ~ 6,000 acre subwatershed the May '05 buffer system reduced 769 pounds of nitrogen per year and the current August '06 system reduced 8 pounds per year* (Table 4). These differences were largely due to the rescission of buffers from intermittent waterways (see Table 5). The estimates of nutrient loads reduced are conservative for both buffer systems but especially low for the May 2005 draft for a number of reasons<sup>2</sup>. It is apparent that the revisions to the PCS have rendered the proposed buffer system poorly effective at its intended task. However, examination of the May 2005 draft also revealed that its extensive buffer system would not allow for orderly development in the southern portion of the watershed. It is clear that a buffer system based on a large body of regional scientific research and excellent local understanding can still be achieved.

### **Relation of the Buffer System to Achieving TMDLs**

DNREC has estimated that the PCS will meet the Total Maximum Daily Load reductions for non-point source nutrients without reductions from the proposed buffer system (Figure 1). However, no assurances exist that the many voluntary actions of the Strategy will be fully implemented. Further, the high cost of individual septic system upgrades calls into question the timely attainment of this regulatory requirement.

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<sup>1</sup> It was assumed that 50% of the agricultural land within the total buffer area was converted to development, that agricultural requirements of the PCS were 50% complete, and that all new development met the stormwater requirements of the PCS. Minor ditches were not buffered in one of the subwatersheds to approximate a realistic development situation.

<sup>2</sup> 1) The increase in nutrient retention by newly buffered waterways themselves were not quantified, 2) the greater load reductions of buffers on intermittent relative to perennial waterways were not quantified, 3) the allowance of fertilized turfgrass buffers in the August 2006 draft was not quantified, 4) protection of currently unregulated wetlands under the May 2005 draft was not addressed.

These uncertainties place greater emphasis on the provision of a highly effective buffer regulation that would make up for the potential shortcomings of the other sections of the PCS.

### **STAC Recommendations**

The STAC provided a number of different recommendations for the formulation of a buffer system for the Inland Bays. Some of the most recurring themes of the discussion are listed below. The STAC advises that DNREC and CIB jointly examine the PCS to determine if the buffer section may be enhanced per these recommendations.

1. Buffer width must be variable based on the type of waterway to be buffered and its condition. A one size fits all approach is not appropriate to maximize nutrient retention.<sup>3</sup>
2. The creation a buffer system must focus foremost on the types and condition of waterways to be buffered, and secondly on width and vegetation requirements. Existing natural waterways and wetlands that are in the best ecological condition should receive priority for buffering.<sup>4</sup> Buffers should begin at the upland edge of streamside wetlands where they are present, not from streambanks. Headwater streams and any adjacent wetlands deserve the greatest amount of protection from buffers.<sup>5</sup> Isolated wetlands, though currently not regulated, filter nutrients from recharging and discharging groundwater and should also be a priority for buffering.
3. Drainage ditches should be given special consideration. Minor drainage ditches, because of their great density, may be difficult to buffer and could act more as pollution conveyances. Filling of minor drainage ditches should be encouraged especially in the southern portion of the watershed. Wide buffers on deep drainage ditches may not greatly increase nutrient filtration because groundwater entering the ditch may bypass the root zone of the buffer where maximum filtration occurs.
4. Buffers on deeply incised streams or streams channelized for agricultural drainage should have widths that allow for the hydrologic reconnection of the stream with its floodplain, either through natural evolution of the channel or wetland restoration.
5. The categorization of waterways as intermittent or perennial for the purpose of assigning different buffers should be reconsidered. Rapid determination of a waterway as intermittent or perennial is difficult due to great variation in the flow patterns of the upstream drainage networkds and to short and long term changes in weather. A mapping approach is recommended.
6. Among buffer vegetation types, native forest provides the greatest amount of nutrient retention and should be required with provisions for viewsapes.
7. Incentives for developers that favor wider buffers and native forests should be offered. These may include tax rebates for preservation, cost assistance for restoration, and compensation for buffering in addition to minimum requirements in the form of added density of homes.
8. Rapid infiltration basins (RIBs) should be placed far from waterways to allow for nutrient filtration in the surficial aquifer prior to discharge into a waterway. Waterways that eventually intercept RIB discharge from groundwater should be maintained in a healthy condition with wide forested buffers to provide maximum nutrient processing.

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<sup>3</sup> For example, smaller flowing waterways may require only a narrow buffer, perhaps 25 feet. Tidal wetlands at the base of steep slopes may require wider buffers, perhaps 100 feet. Tidal marshes with gradual transition into uplands may require wider buffers still, perhaps 300 feet, to maximize retention and allow for marsh migration with rising sea level.

<sup>4</sup> These least-altered ecosystems have the greatest capacity to reduce nutrient concentrations and provide clean water to the Bays.

<sup>5</sup> Headwaters, tend to flow intermittently, and because of their great number (~75% of total waterway length [Table 5.]) and high nutrient loads, are the most important for protecting water quality.

**Tables and Figures**

Table 1. Attendees of the buffer subcommittee meeting of the CIB STAC, September 15, 2006. One individual submitted written comments in lieu of attendance.

<b>Name</b>	<b>Affiliation</b>
Kent Price	Center for the Inland Bays
Tom McKenna	Delaware Geological Survey
Scott Andres	Delaware Geological Survey
Judy Denver	United States Geological Survey
Ben Anderson	DNREC – Watershed Assessment Section
Sergio Huerta	DNREC – Environmental Laboratory
Christopher Bason	Center for the Inland Bays
Edythe Humphries	DNREC – Environmental Laboratory
Harry Haon	Citizen, Fenwick Island
Ed Lewandowski	Center for the Inland Bays
Kathy Bunting-Howarth	DNREC – Division of Water Resources
John Schneider	DNREC – Division of Water Resources
Lyle Jones	DNREC – Division of Water Resources
Jennifer Volk	DNREC – Division of Water Resources
Bruce Vasilas	University of Delaware – Dept. Plant & Soil Science
Bill Ullman	University of Delaware – College of Marine & Earth Studies
Terry Higgins	Wesley College (rtd.)
A.G. Robbins	Citizen
Paul Sample	Technical Advisory Office
William Moyer	Duffield Associates
Joe Farrell	University of Delaware Sea Grant
Robin Tyler	DNREC – Division of Water Resources
Jeff Tinsman	DNREC – Fisheries Section
Ed Whereat	University of Delaware Sea Grant Citizens Monitoring Program

Table 2. Description of the components of a buffer system to protect water quality.

<b>Buffer Component</b>	<b>Description</b>	<b>Importance</b>
Waterways Buffered	The type of water features buffered. Categorized as wetlands, tidal waters, and intermittent and perennial streams and ditches.	Different waterways provide different levels of nutrient retention and may require wider or more-narrow buffers to perform the best.
Width of Buffer	In feet, from the upland edge of a wetland or tidal water, or the bank of a stream or ditch.	Wider buffers increase nutrient retention to a point based on other buffer components
Vegetation in Buffer	Structure and species composition of the buffer. Ranges from simply the presence of turfgrass to a native forest.	Forested buffers provide the best nutrient retention in buffers and in streams and ditches themselves.
Variations Allowed in Buffer	Allowable structures in the buffer and departures from the requirements of the other buffer components.	Example: Viewsapes over tidal waters or presence of stormwater facilities.

Table 3. Comparison of the buffer provisions of the Pollution Control Strategy drafts and current Sussex County Code. \*PCS 05/05 offers *de facto* protections of isolated wetlands.

	<b>PCS 5/05</b>	<b>PCS 8/06</b>	<b>Sussex Co.</b>
Tidal Waters/Wetlands	100'	50'	50'
Isolated Wetlands	100'*	No Buffer	No Buffer
Federal Reg. Wetlands	100'	No Buffer	No Buffer
Perennial Streams	100'	50'	50'
Perennial Ditches	100'	50'	No Buffer
Intermittent Waterways	100'	No Buffer	No Buffer
Vegetation Requirements	75% Native Forest	Any Vegetation	Natural Vegetation

Table 4. Comparison of nutrient load reductions from buffers systems of two drafts of the Pollution Control Strategy in two subwatersheds of the Inland Bays Watershed.

		Nitrogen			Phosphorus		
		PCS 5/05	PCS 8/06	% Difference	PCS 5/05	PCS 8/06	% Difference
Load Reduction (lbs/year)	Hopkins Prong	769	7.90	99.0	47.5	0.6	98.8
	Dirickson Creek	5,030	114.50	97.7	310.4	8.2	97.3

Table 5. Comparison waterway length for two Inland Bays subwatersheds representing different regions. Length is in feet.

	Hopkins Prong Watershed		Dirickson Creek Watershed	
Region	Northern		Southern	
Watershed Area (ac)	5,908		7,858	
Intermittent Waterway Length	15,802	(58%)	181,619	(93%)
Perennial Waterway Length	4,472	(16%)	9,773	(5%)
Tidal Stream Length	7,113	(26%)	3,959	(2%)
Total Waterway Length	27,388	(100%)	195,352	(100%)

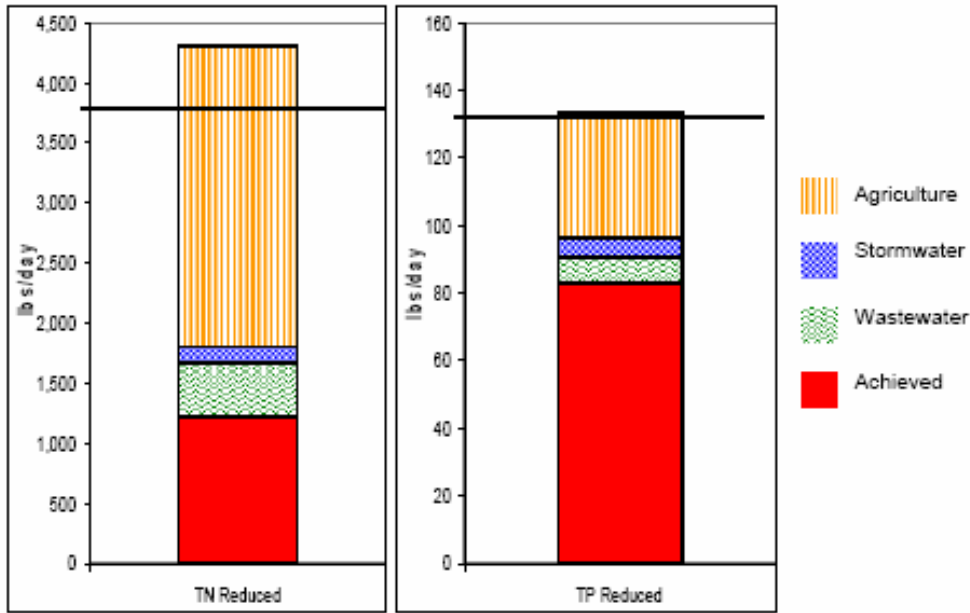


Figure 1. Pollution Control Strategy's progress towards implementation and modeled reduction by source. From the 3<sup>rd</sup> Workshop Draft of the Inland Bays Pollution Control Strategy and Proposed Regulations (August 2006).