URBAN RIPARIAN BUFFERS

Inland Bays Watershed Tributary Action Team, January 2001
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INTRODUCTION

The Department of Natural Resources and Environmental Control has undertaken an initiative that—among other environmental objectives—has relevance to achieving total maximum daily loads (TMDLs) for the Inland Bays Watershed. As of this writing, the results from this buffer project are still preliminary.

What happens if the Inland Bays are buffered?

That is, *What lands would be affected*—both in terms of types of land and acreages? And, to the extent that we can determine, *What reductions could we anticipate in terms of nitrogen and phosphorous loads?*

FRANKFORD PILOT

To get a better sense of *what questions* the Department needed to answer (and *how to best answer those questions*) a pilot project was initiated. Creating a model for a geographic area as large as the Inland Bays can be time consuming. In order to efficiently and more accurately create this buffer model, the methodology was "tweaked and critiqued" on a smaller, pilot area.

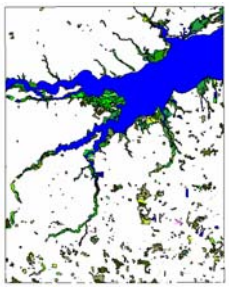
The Frankford Quadrangle was chosen for the pilot project ("quadrangle" or "quad" represents the geographic area encompassed by a U.S. Geological Survey 7.5-minute series map). Such quads—54 for Delaware, and 13 for the Inland Bays—have long been the standard unit for the collection of geographic information system (GIS) data. And a buffer project of this scale certainly requires use of a GIS.

What to buffer

Upon selection of a geographic area to buffer, specific landscape features must be identified for buffering. Based largely upon H.R. 32 Buffer Committee discussions, the Department elected to buffer *waterways* and *wetlands.*

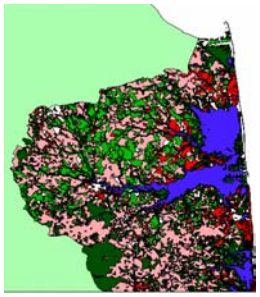
Specifically buffered were **waterways** over which there exists substantive regulatory authority*:* the Inland Bays themselves, rivers, streams, and tributaries. (Agricultural ditches were differentiated from these "natural waters," and were not buffered—because, unlike natural water, ditches are not regulated by both State of Delaware and federal law.)

Tidal wetlands are jurisdictional waters under both State law (Delaware Wetlands Act) and federal law (Clean Water Act; River and Harbors Act). **Nontidal wetlands** were not buffered, because the extent to which these "waters of the U.S." are protected is less clear. (In particular, a recent U.S. Supreme Court ruling may substantially limit the regulatory authority over isolated—or "non-riparian"—wetlands.



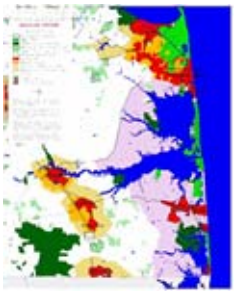
Lands within buffers: Different perspectives.

A scientific perspective is: *What are the soil types within the buffer?* Available studies give insight, for example, as to how effective poorly-drained soils are for nutrient reduction, versus the effectiveness of moderately- to well-drained soils.



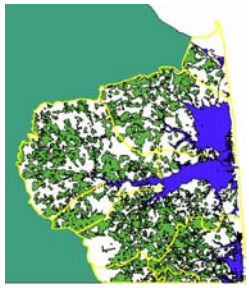
A political perspective is: *What are the land uses within the buffer?* Experience tells us—even warns us—that who owns the land, what they're doing with it, and what they plan to do with it are principal determinants in whether those lands will ever become buffers.

With regard to land use, we'd like to be able to answer questions as to not only, *How many acres are being affected?* but also, *What types of acreage?* The Office of Planning's Investment Strategies Data[1] differentiates between areas*: Where growth is occuring in and around existing communities*; *Where growth is not being encouraged*; and *Where growth is being discouraged* because the area is environmentally sensitive. Growth is thus guided by investment (or non-investment) of State monies.



How is farmland affected?

Also crucially important from a land-use perspective is, *Where are the agricultural lands?* Recent land use data identified areas unavailable for buffering due to Nutrient Management Act prohibitions.

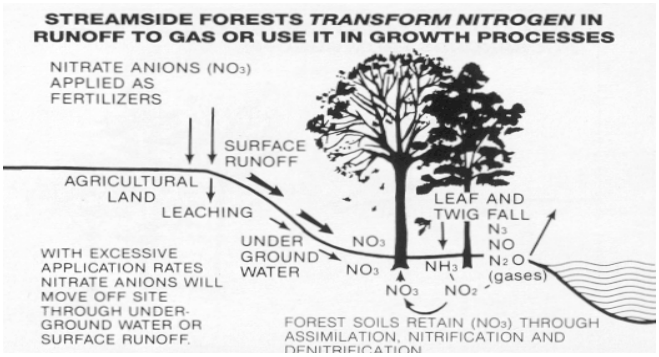


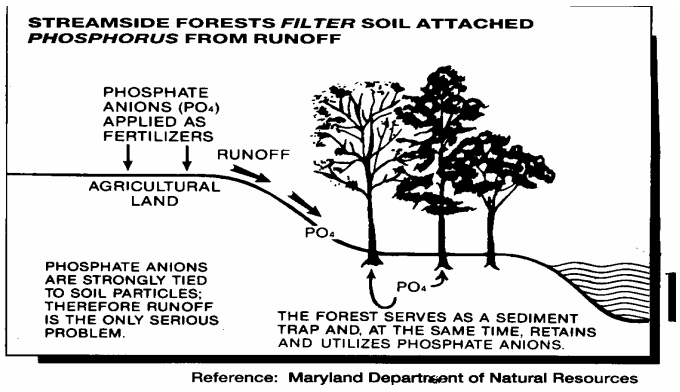
[1] *http://www.state.de.us/planning/shape/strategy/summary.htm*

How wide should buffers be?

Buffer widths are project-specific, and depend on project objectives: For example, from the standpoint of:

- ***wildlife,*** *Are there particular species to protect?*
- ***engineering,*** *Are there specific water volumes to attenuate?*
- ***political,*** *Are there particular economic impacts to consider?*
- ***TMDLs,*** *Are there particular nutrient reductions to effectuate?*





The Department applied buffers of 50-, 100-, and 200-foot around streams and tidal wetlands. Nutrient load reductions were calculated for the 100-foot buffer, because comparable buffer effectiveness rates were available for the 100-foot distance[2]. The model can adjust to different buffer widths, as improved data becomes available for these distances for land types comparable to the Inland Bays Watershed.

Is the Pilot area representative of the Watershed?

The Frankford Quad was chosen because it is fully contained within the Inland Bays Watershed, and its diversity includes:

- ✓ *Expansive agricultural areas, as well as non-agricultural areas*
- ✓ *Extensively ditched areas, and areas not so ditched*
- ✓ *Tidal portions, and non-tidal portions*
- ✓ *Existing communities, expanding communities, rural areas, and environmentally sensitive areas.*

Nonetheless, pilot area results may not proportionately reflect overall Watershed results.

Pilot Results: Acreage Affected by (Non-Agric.) Buffers

- *28,000± acres of land area in Quad (excludes open water areas)*
- *50-foot buffers would comprise 4% of land area*
- *100-foot buffers comprise 8% of land area (or, 2,303 acres)*
- *200-foot buffers would comprise 14%*

[2] *State of Maryland. 1996.*

Assumptions of the Nutrient Reduction Model

- *Each acre of buffer land buffers itself, plus two upland acres[3].*

- *Nutrient reductions via buffers were based on conversion of **agricultural land** to forested buffer – not **urban land** to forested buffer. Because agricultural nutrient loads likely differ from urban nutrient loads, the shown reductions will likely change when appropriate urban loads for the Inland Bays Watershed are plugged into the model.*

Other Buffer Initiatives

The University of Delaware study has applied a GIS buffer model *specifically to agricultural lands*—using, for example, 60-meter buffers[4]. In principal, those buffers on agricultural lands should complement the Department's buffers on non-agricultural lands—providing estimates of overall watershed nutrient reductions which may be possible, though likely under different administrative mechanisms.

The Department's Division of Soil and Water Conservation is developing site-specific riparian buffer designs that specify widths, vegetation types and distribution, and land conditions[5]. This Riparian Buffer Analysis System combines layers of information about an area to provide a better understanding of what kind of buffer should be installed.

Frankford Pilot Nutrient Reduction Calculations

- Maryland's Lower Eastern Shore agricultural nutrient loading rates and buffer effectiveness rates[6] were applied to the Frankford Quad buffer acreages. (Essentially asking: *If Inland Bays Watershed loading rates are comparable to Maryland's loading rates, What is the nutrient reduction we could anticipate for Delaware?)*
- Delaware-specific loading rates for agricultural areas were also applied to the Quad buffer acreages. (These Delaware-specific numbers are anticipated to be more representative of the Inland Bays, since Sims et al. [1996] studied lands within the Watershed.)
- The Department will also apply loading rates for urban areas[7] to refine reduction estimates.

Pilot Results: Using Delaware-Specific Loading Rates

Preliminary results—employing 100-foot buffers, agricultural loading rates, and forested buffer effectiveness rates as described above—could reduce loading:

- *275 lbs./day of groundwater nitrogen to 94 lbs./day*
- *200 lbs./day surface water nitrogen to 80 lbs./day, and*
- *3.27 lbs./day surface water phosphorous to 0.98 lbs./day*

Note: The general scientific consensus is that no significant reductions in groundwater phosphorous can be anticipated from riparian buffers[8].

[3] *State of Maryland, 1996*
[4] *http://bluehen.ags.udel.edu/spatlab/spot/*
[5] *For add'l info., contact the Delaware Coastal Management Program*
[6] *State of Maryland, 1996*
[7] *Martin, Jr. J.H., J.G. Farrell, and CC. Balascio, 2001*
[8] *Clausen et al., 2001*