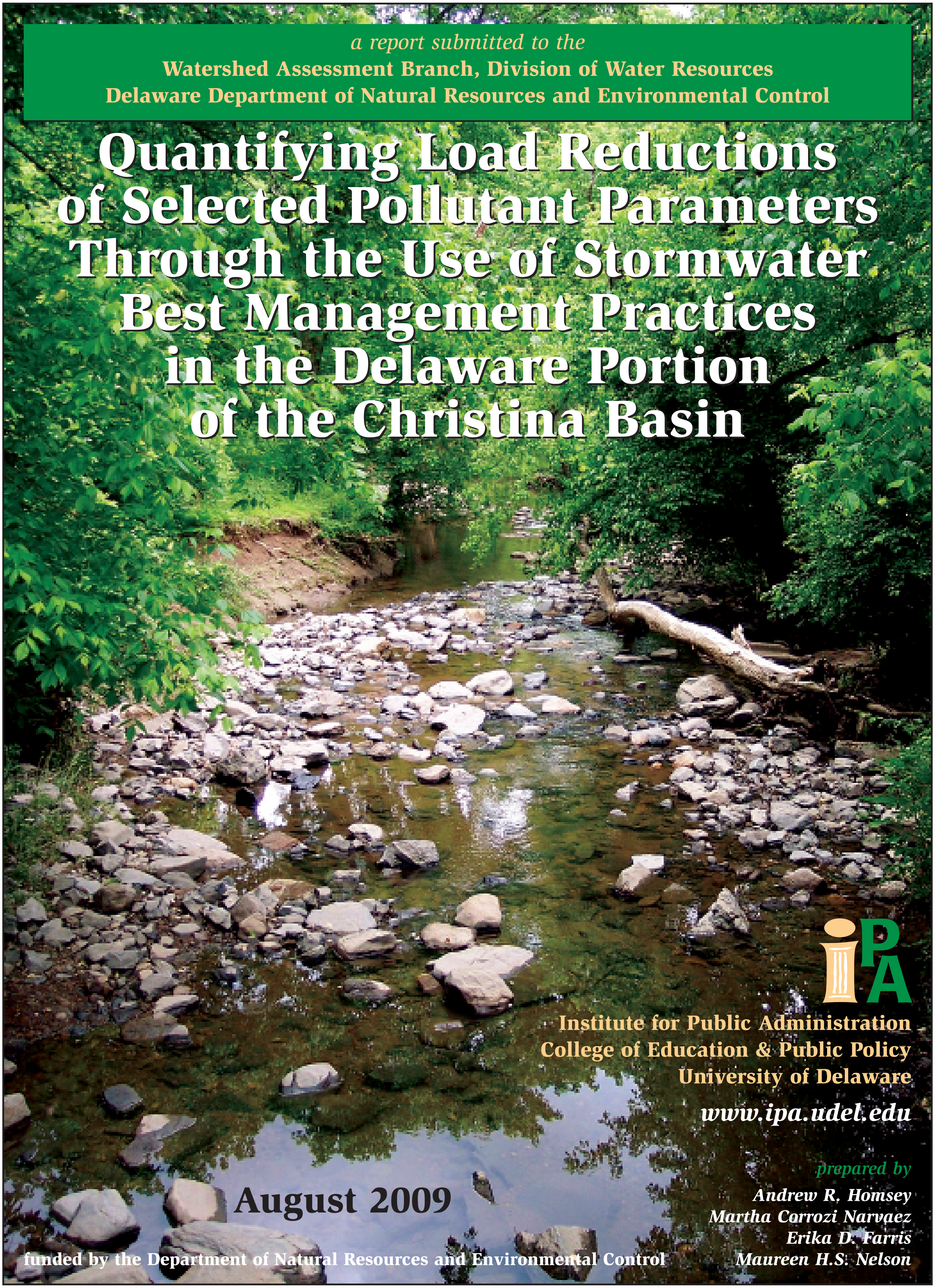

a report submitted to the

Watershed Assessment Branch, Division of Water Resources
Delaware Department of Natural Resources and Environmental Control

Quantifying Load Reductions of Selected Pollutant Parameters Through the Use of Stormwater Best Management Practices in the Delaware Portion of the Christina Basin

Institute for Public Administration
College of Education & Public Policy
University of Delaware

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August 2009

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funded by the Department of Natural Resources and Environmental Control

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Preface

The University of Delaware's Institute for Public Administration (IPA) addresses the policy, planning, and management needs of its partners through the integration of applied research, professional development, and the education of tomorrow's leaders. The Water Resources Agency, a unit of the Institute for Public Administration, provides water resources planning and policy assistance to governments in Delaware, the Delaware Valley, and along the Eastern Seaboard through the University's land grant public service, education, and research roles.

At the request of the Delaware Department of Natural Resources and Environmental Control (DNREC), IPA's Water Resources Agency developed a process to quantify load reductions achieved through stormwater-control structures (best management practices, or BMPs) for selected pollutant parameters in the Delaware portion of the Christina Basin. The Water Resources Agency has compiled this report to summarize the scope of the project and outline the methodology, analysis, and implications. This process and report will serve the Christina Basin Tributary Action Team, the Christina Basin Clean Water Partnership, watershed managers throughout the state, as well as federal, state, and local decision-makers.

This project and report, *Quantifying Load Reductions of Selected Pollutant Parameters Through the Use of Stormwater Best Management Practices in the Delaware Portion of the Christina Basin* was funded by DNREC.

Jerome R. Lewis, Director
Institute for Public Administration

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I. Introduction

At the request of the Delaware Department of Natural Resources and Environmental Control (DNREC), the Water Resources Agency (WRA), a unit of the University of Delaware's Institute for Public Administration, developed a process to quantify load reductions achieved through stormwater-control structures (best management practices, or BMPs) for selected pollutant parameters in the Delaware portion of the Christina Basin. This report summarizes the scope of the project and outlines the methodology, analysis, and implications. This project was funded by DNREC.

In April 2005, the U.S. Environmental Protection Agency (USEPA) established the Christina Basin high-flow TMDLs for nutrients and bacteria to improve the water quality of the rivers and tributaries that comprise the Delaware portion of the Christina Basin. WRA and DNREC formed and facilitated a Tributary Action Team for the Delaware portion of the basin. The team developed a Pollution Control Strategy (PCS) that contains recommendations for reducing nonpoint-source nitrogen, phosphorus, and bacteria loads to the waters of the Delaware portion of the Christina Basin. One of the recommendations outlined in the PCS is to retrofit existing stormwater BMPs in order to effectively reduce sediment, bacteria, and nutrient loading. In considering the implementation of this recommendation, DNREC and WRA found that in order to address and prioritize the stormwater BMP retrofits, it is critical to determine the pollutant reduction achieved from the existing stormwater BMPs. It was then determined that WRA would conduct an analysis so that data are available to develop a systematic approach to stormwater BMP retrofits in the Delaware portion of the Christina Basin.

This study has been undertaken to provide a method to rapidly assess the effect of stormwater controls on water quality over a large spatial extent. It does not take the place of individualized assessments on a site-by-site basis, which will provide more accurate and detailed information for any particular BMP. However, such analysis is quite costly, time-consuming, and, therefore, impractical for implementation at the watershed or sub-watershed scale. The advantage of employing a methodology such as that presented here is that it can be implemented quickly, has minimal field-work requirements, can be repeated at regular, frequent time intervals using equivalent data sources, and can be applied at the watershed scale. Note that the stormwater being treated is from surface flow; also occurring are impacts from groundwater and infiltration. This is solely a study on surface-water treatment.

In order to identify the priority retrofit sites, WRA has developed a process to quantify load reductions of stormwater BMPs for selected pollutant parameters. The load reductions achieved from designated stormwater BMPs in the watershed were determined by first digitizing the catchment areas, based on surface runoff and piped-flow directions. Next, the land use and impervious cover coefficients within each BMP's catchment area were measured. Then stormwater BMPs were assigned reduction values for each pollutant parameter, and the pollutant reductions were calculated. Analysis was also undertaken to determine the extent to which stormwater ponds associated with residential and commercial subdivisions addressed the stormwater generated by that subdivision. While this study focused on the Delaware portion of the Christina Basin, the methodology was developed and refined using the Appoquinimink River watershed.

II. Methodology

Data discovery and assessment

The results of the analysis of drainage areas and pollution loads associated with stormwater-control structures are heavily influenced by the nature and accuracy of the input data used. For example, initial investigations on load reductions undertaken using digital elevation model (DEM) data with a ground resolution of ten meters were not fruitful, since the catchment areas for most BMPs considered were small relative to the resolution of the elevation data. Similarly, accurate information about the type and location of BMPs and other stormwater control structures—such as catchbasins, pipes, culverts, and outfalls—are critical to any such investigation. Identification, compilation, assessment, and pre-processing of data to be used in the assessment of pollution-load reductions and analysis of subdivision drainage is, therefore, a critical element of this study. Data that have recently become available, described below, enabled the current study and were collected and processed for the Appoquinimink River watershed as well as the four watersheds of the Christina Basin—the Brandywine, Red Clay, and White Clay Creeks, and Christina River.

BMP data

Data for stormwater BMPs were acquired from the New Castle County Department of Special Services. Through initial assessment of data provided by the Center for Watershed Protection (including BMP locations and outfalls), it was determined that these data were not adequate due to apparent inaccuracies in their locations. The BMP data from New Castle County did not include areas within municipalities; therefore, an attempt was made to acquire similar BMP data for all towns within the basin. Data were obtained for Newark and for the University of Delaware campus but were unable to be obtained for all other municipalities within the basin, including Newport, Elsmere, and Wilmington. Further work should include acquisition of these data, as they represent gaps in the analysis coverage.

After initial review, it was decided, in conjunction with DNREC personnel, that the study would include only wet and dry stormwater ponds and would exclude structures such as pocket wetlands, biofiltration devices, rain gardens, etc. This decision was made for practical reasons, since reductions from these practices are often highly variable, and the BMPs themselves are often difficult to locate using aerial photography. Also, wet and dry ponds comprise the majority of BMP structures in the database—between 60 and 70 percent of all BMPs across the watershed. It is important to note that although these practices are not included in this analysis, nonstructural and low impact stormwater management practices are very important and have a positive impact on pollutant removal throughout the watershed.

Other stormwater infrastructure

Often, stormwater BMPs are an element in a wider infrastructure of controls. These include catch basins, pipes, culverts, ditches, outfalls, etc. Accurate stormwater infrastructure is, therefore, critical in determining how water flows through the system.

Such infrastructure data were acquired through the Delaware Department of Transportation (DelDOT) and their contractor, KCI, Inc. Data features included point and linear stormwater structures for the five watersheds (Brandywine, Red Clay, and White Clay Creeks, and Christina and Appoquinimink Rivers), as well as flow direction information for each linear conveyance.

LIDAR and derived data products

To determine overland flow and delineate the catchments associated with BMPs, it is crucial to have accurate elevation data. From 2005-2007 the state of Delaware commissioned the acquisition of high-quality, statewide LIDAR (Light Detection and Ranging). Using bare-ground point data, a DEM at two-meter resolution was generated. From this dataset, data necessary for determination of catchments were created, including a depression-filled DEM, a flow-direction raster, and a flow-accumulation raster. These data allowed for the automated delineation of catchments and facilitated visual interpretation of overland drainage associated with each BMP.

Land use and impervious cover data

Since each land use type (e.g., residential, commercial, industrial, agricultural) generates, on average, a characteristic amount of various pollutants per unit area, accurate land use data are crucial in determining the amount of a pollutant that ends up in a stormwater pond. Also, the amount of impervious cover, or hard surfaces, within a catchment largely determines the amount of water that will run off and, thus, transport pollutants. Both types of data were obtained from the state of Delaware, which had commissioned creation of these data sets for the year 2007.

To conform to loading model specifications, the land use data categories were mapped to those employed in the Simple Loading Model developed by the Center for Watershed Protection (Schueler, 1987).

Subdivisions

DNREC wished to determine the extent to which stormwater ponds were effectively treating the runoff produced by their associated subdivisions. To enable this analysis, the latest subdivision boundaries were obtained from the New Castle County Department of Land Use. A subset of subdivisions within each watershed and associated BMPs was also created for this analysis. Where a subdivision was divided into several parcels, such as in a multi-phase project, these features were merged into a single subdivision.

Ancillary spatial data

Other data were collected to assist in the visual analysis and interpretation of the BMP catchment areas. These included aerial photography obtained from the state of Delaware in 2007, which corresponds to both the land use and impervious-cover data described above, watershed boundaries from the Water Resources Agency, municipal boundaries from the state of Delaware’s data repository, and flowlines from the USEPA/USGS National Hydrography Dataset (NHD).

Loading and reduction data

Based on initial data discovery, the needs of DNREC, and priorities outlined in the Christina Basin PCS, it was determined that the pollutants to be considered in this study would be total suspended sediment (TSS), total nitrogen (TN), total phosphorous (TP), and bacteria. For the purposes of this study, fecal coliform values were used to represent loading rates for bacteria. A review of the literature on pollution-loading rates and BMP reduction efficiencies was performed to determine the optimal values to use for this study. In consultation with DNREC, it was determined that the following values derived from the literature would be used for loading rates from various land use types:

	TSS[1] (mg/L)	Bacteria[1] (fecal coliform-MPN/100mL)	TN[1] (mg/L)	TP[1] (mg/L)
Residential	49	7000	2.1	0.31
Commercial	43	4600	2.1	0.22
Industrial	81	2400	2.1	0.25
Agricultural	300	11000	4.3	0.60
Open Space	48	1700	2.3	0.31
Forest	20	800	1.1	0.12
Lawns	125*	2400	9.1	2.10
Roof	9	110	2.1	0.11
Parking Lot	27	180	1.9	0.15
Driveway	173	1700	2.1	0.56
Street	172	3700	1.4	0.55
Landscaping	37	9400	--	--
Water-Wetland	0	0	0	0

Table 2.1 Event mean concentrations for various land use types, by pollutant of concern.
[1]Schueler, et al. 2007 B-3 B-4.
[*]Lucas 2004

The following table summarizes the reduction efficiencies, by pollutant type and pond type that were used in this study. These values were approved by DNREC:

BMP Type	TN[1]	TP[1]	TSS[2]	Bacteria (Low)	Bacteria (High)
Dry Pond	15%	25%	49%	0%[3]	0%[3]
Wet Pond	33%	51%	80%	50%[4]	95%[4]

Table 2.2 – Reduction efficiencies for pollutants of interest, by BMP type. Note that bacteria reductions are reported as a range, with values representing the highest and lowest reduction efficiencies. Source:
[1]Department of Natural Resources and Environmental Control, Division of Water Resources, Watershed Assessment Section Appendix M.
[2]Center for Watershed Protection 6 of 10.
[3]Clary, et al. 1–4.
[4]Schueler, et al. 2007 166.

In the real world, loading rates for land uses can vary widely, and reduction rates for specific BMPs are highly dependent on their particular design characteristics and level of maintenance. In addition, in Delaware, post-1991 all new development activities required a review for *water quality* impacts prior to their approval. Thus, stormwater BMPs installed post-1991 were designed to address water quantity *and* water quality. This is important to note because some of the wet and dry ponds in the study area pre-date 1991 and were only intended for water volume control and may not achieve the desired/ expected reduction efficiencies. To allow relatively rapid modeling of loads and reductions across large areas with many BMPs, values were used that represented averages derived from a wide array of individual studies.

Procedures

Initial development of catchment delineation procedures and load/reduction values was undertaken for the Appoquinimink River watershed. This was done to both refine the process and compare initial results with investigations for DNREC that had already occurred in this watershed. Subsequently, the four watersheds of the Christina Basin in Delaware were processed using the same methods. For the mapping and data-analysis portion of the project, ESRI's ArcInfo GIS software was used.

Identification and delineation of stormwater ponds
The layer of ponds for each watershed was overlaid on the 2007 orthophotography, and the limits of each pond were digitized, where visible. Numeric identifiers were assigned to each digitized pond corresponding to the ID of the BMP and the subdivision that it drains.

In some cases ponds were not visible on the orthophotography or did not drain any appreciable land area. These ponds were not included in the analysis. See Appendix C for a list of the ponds that were not included in the analysis.

Definition of initial overland flow catchments
Once the pond was digitized, an initial assessment of the overland flow to that pond was performed. For simple catchments, a visual assessment was performed; for complex catchments, drawing tools were used to sketch the limits of this overland flow. This assessment was performed by overlaying the flow-accumulation rasters on the orthophotography. The accumulation raster provides a visual display of the pathways water takes over land.

Creation and verification of secondary receiving areas
Using the stormwater infrastructure layer of structures and conveyances, secondary receiving areas associated with each pond were identified. These secondary receiving areas consist of catch basins or other catchment devices that introduce stormwater runoff into the infrastructure of pipes, culverts, or other conveyances. Where a conveyance crosses a temporary catchment boundary (see description above), water is transported in or out of the catchment. The most downstream catchment devices in the system of pipes were digitized into the layer of receiving areas (or "pour points"). Those pour points that carry water into a catchment were given the IDs of the associated BMP and subdivision. Pour points that carry water out of a catchment were given the ID of either the associated BMP catchment and subdivision the water is being transported into or "-1" if the water is not being transported to another BMP catchment. See the figure below for an example of the data layers used in these analyses.

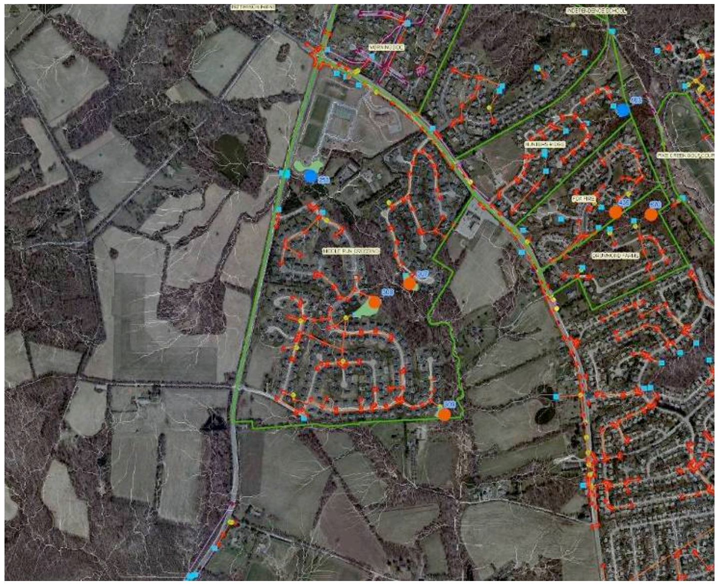

Figure 2.1 Screenshot of layers used in the delineation of receiving areas for a BMP catchment. Note that the overland flow lines (in white) are superimposed on the aerial imagery. The stormwater infrastructure is shown as red lines and dots. The ponds and secondary pour points are in green. Blue and orange dots represent the original file of BMPs (wet and dry ponds, respectively). Green lines represent subdivisions.

Refinement and verification of catchment areas

Using hydrologic GIS tools, an initial set of catchments for each watershed was produced. These catchments were used to systematically assess each catchment. Discrepancies, such as where a stormwater conveyance crossed a catchment boundary, could be identified easily and corrected by enabling the identification of pour points that had been overlooked or misidentified.

Figure 2.2 Screenshot of preliminary catchments. Note the areas, circled in red, where a conveyance crosses a catchment boundary, indicating a discrepancy.

Crosswalk of 2007 land use and model land use categories

To determine loading rates and reductions the "Simple Method," developed by the Center for Watershed Protection (Schueler, 1987), was used. This model is based on certain characteristic concentration values, which vary by land use type. Therefore, it was necessary to convert categories from the 2007 land use layer to values corresponding to those used in the model. Categories used by the model include residential, commercial, industrial, agriculture, open space, forest, lawns, roof, parking lot, driveway, street, and landscaping. See Appendix B for a mapping of land use types from the 2007 data to the categories used in the loading calculations. In consultation with DNREC, it was determined that for the purposes of this study, water and wetlands have a loading rate of 0, and therefore do not affect the final loading rates.

Land use and impervious-cover percentages

Using tools developed in-house by WRA, the area of each land use type within each catchment was calculated. Similarly, the percentage of impervious cover within each catchment was calculated. These values were used to calculate pollutant loads and reductions associated with BMPs and their catchment areas. See Figures 6.1–6.4 for a summary of land use areas within the BMP catchments for each watershed.

Spreadsheet-based model of loads and reductions

For this analysis the Simple Method modeling procedures (Schueler, 1987) were used to estimate the stormwater-runoff loads and reductions for selected pollutants within selected BMPs in the Delaware portion of the Christina Basin. It was determined that the Simple Method provided a scale-appropriate method that depended on easily determined inputs and that could be applied over a large (watershed-scale) area. See Appendix A for a review of several models assessed for use in this project and for a detailed description of the Simple Method. Figures 6.5–6.8 present a summary of the loads for each pollutant by land use type within BMP catchments.

Analysis of subdivisions

To determine the effectiveness of BMPs at addressing the water runoff from their associated subdivision, the layer of catchments was intersected with the layer of subdivisions for each watershed. The amount of each subdivision drained by its associated BMPs could be determined, as well as the area within the subdivision not drained by these catchments and the area of catchments falling outside its associated subdivision. A summary of this information is presented in Tables 5.1–5.4.

III. Discussion and Analysis

The data collected are summarized in this section according to watersheds. Included in the data are the total number of wet and dry ponds per watershed and the area of each. The land use for the catchment areas in each watershed is presented in Figures 6.1–6.4, and the loads for each pollutant contributed by the catchments in each watershed are presented in Figures 6.5–6.8. In addition, the loading rates, reduction rates, and resultant loads for each pollutant parameter are provided.

The following table summarizes the number and areas of stormwater pond BMPs in each of the four watersheds of the Delaware portion of the Christina Basin—Brandywine, Red Clay, and White Clay Creeks, and Christina River. Of a total of over 100,000 acres, stormwater ponds cover 14.5 percent of the Christina Basin in Delaware. The Brandywine Creek watershed has the smallest percentage of its land treated by ponds, while the White Clay has the highest (3.3 and 19.1 percent, respectively). The Christina River watershed has both the most ponds (287) and acreage treated (6,587), while Brandywine Creek watershed has the fewest ponds (29) and least acreage treated (490).

		Wet Ponds		Dry Ponds		All Ponds		
Watershed	**Acres**	**Count**	**Acres**	**Count**	**Acres**	**Count**	**Acres**	**Portion of Watershed**
Brandywine	14,738	8	244	21	246	29	490	3.3%
Red Clay	13,558	18	557	33	1,258	51	1,814	13.4%
White Clay	29,678	89	2,033	144	3,647	233	5,680	19.1%
Christina	42,622	120	2,759	167	3,828	287	6,587	15.5%
Totals	**100,597**	**235**	**5,593**	**365**	**8,979**	**600**	**14,571**	**14.5%**

Table 3.1 Acreages of watersheds and areas treated by stormwater pond BMPs, plus the number and percent coverage, by watershed, of stormwater ponds.

The following tables (3.2–3.5) present the loading rates, load reductions, and the resultant loads associated with wet and dry ponds for each of the watersheds within the Christina Basin.

	Brandywine Creek Watershed								
	Wet Pond			Dry Pond			Total		
	Load	Reduction	Resultant Load	Load	Reduction	Resultant Load	Load	Reduction	Resultant Load
TSS (lbs/yr)	37085	29668	7417	35292	17293	17999	72377	46961	25416
TN (lbs/yr)	1382	456	926	2009	301	1708	3391	757	2634
TP (lbs/yr)	185	94	90	368	92	276	553	186	367
Bacteria (low)	11720	5860	5860	12341	0	12341	24061	5860	18201
Bacteria (high)		11134	586		0	12341		11134	12927

Table 3.2 Summary of loads and reductions for selected pollutants within the catchments of the Brandywine Creek watershed. Values are in pounds per year, except bacteria, which is expressed in billions of colonies per year, at both the low and high ranges of reduction efficiencies.

Red Clay Creek Watershed									
	Wet Pond			Dry Pond			Total		
	Load	Reduction	Resultant Load	Load	Reduction	Resultant Load	Load	Reduction	Resultant Load
TSS (lbs/yr)	82670	66136	16534	264169	129443	134726	346839	195579	151260
TN (lbs/yr)	3069	1013	818	12732	1910	10822	15800	2922	11640
TP (lbs/yr)	483	246	237	2190	547	1642	2672	794	1879
Bacteria (low)	36733	18366	18366	126154	0	126154	162887	18366	144521
Bacteria (high)		34896	1837		0	126154		34896	127991

Table 3.3 Summary of loads and reductions for selected pollutants within the catchments of the Red Clay Creek watershed. Values are in pounds per year, except bacteria, which is expressed as the most probable number of colonies per year, at both the low and high ranges of reduction efficiencies.

White Clay Creek Watershed									
	Wet Pond			Dry Pond			Total		
	Load	Reduction	Resultant Load	Load	Reduction	Resultant Load	Load	Reduction	Resultant Load
TSS (lbs/yr)	447896	358317	89579	572686	280616	292070	1020582	638933	381649
TN (lbs/yr)	17542	5789	634	22283	3343	18941	39825	9131	19575
TP (lbs/yr)	2560	1306	1254	3194	798	2395	5754	2104	3650
Bacteria (low)	171566	85783	85783	278371	0	278371	449937	85783	364154
Bacteria (high)		162988	8578		0	278371		162988	286949

Table 3.4 Summary of loads and reductions for selected pollutants within the catchments of the White Clay Creek watershed. Values are in pounds per year, except bacteria, which is expressed as the most probable number of colonies per year, at both the low and high ranges of reduction efficiencies.

Christina River Watershed									
	Wet Pond			Dry Pond			Total		
	Load	Reduction	Resultant Load	Load	Reduction	Resultant Load	Load	Reduction	Resultant Load
TSS (lbs/yr)	555692	444553	111138	633166	310252	322915	1188858	754805	434053
TN (lbs/yr)	20880	6890	2043	24601	3690	20911	45481	10580	22954
TP (lbs/yr)	2896	1477	1419	3543	886	2657	6439	2363	4076
Bacteria (low)	240594	120297	120297	284353	0	284353	524947	120297	404650
Bacteria (high)		228564	12030		0	284353		228564	296383

Table 3.5 Summary of loads and reductions for selected pollutants within the catchments of the Christina River watershed. Values are in pounds per year, except bacteria, which is expressed as the most probable number of colonies per year, at both the low and high ranges of reduction efficiencies.

Table 3.6 shows the number of subdivisions treated by BMPs in each watershed. Christina and White Clay contained significantly more subdivisions treated by wet and dry ponds than did Brandywine and Red Clay. This could be attributed to different land development patterns, as well as to the fact that the latter watersheds were developed earlier, before such stormwater control practices were as prevalent.

Watershed	Number of Subdivisions	Subdivision Acreage	Average Subdivision Acres	Watershed Area (Sq. Mi.)	Subdivisions Per Sq. Mi.
Brandywine	26	1283	49.3	23.03	1.13
Red Clay	40	2212	55.3	21.18	1.89
White Clay	191	6555	34.3	46.37	4.12
Christina	224	10796	48.2	66.60	3.36

Table 3.6 Number and area of subdivisions treated by BMPs associated with each watershed, plus density of subdivisions with stormwater ponds.

It was found that many subdivisions in the Delaware portion of the Christina Basin were drained by more than one BMP. BMPs generally only treated a percentage of the subdivision area they were designed to treat. In some cases, the area drained by a pond extended well beyond the limits of the subdivision. Tables 5.1–5.4 summarize, for each subdivision, the number of BMPs associated with it, the acres treated by each BMP, and acres left untreated by each BMP for the Brandywine, Red Clay, and White Clay Creeks, and Christina River watersheds.

IV. Implications and Restraints

Benefits

Several broad benefits of the methodology presented have become evident through the data collection, GIS, and data analysis procedures of this project. These benefits include the following:

- *Enabling of rapid watershed assessment*: This process provides the ability to conduct rapid watershed assessment applying GIS and remote-sensing data to calculate loads and reductions.
- *Broad applicability throughout the state*: TMDLs have been established in more than 30 waterways in the state, and, as part of this process, it is critical to calculate the existing stormwater BMP load reductions. This methodology can be applied to watersheds throughout the state and will aid DNREC in tracking the stormwater BMP reductions in each watershed. This process will also help the Tributary Action Teams understand the impact of the existing stormwater BMPs and the remaining reductions that must be achieved to meet the TMDLs in a designated watershed.
- *Ability to verify projected drainage areas for stormwater BMPs*: This will enable DNREC and local permitting agencies, such as New Castle County, to determine whether the original design of the site and the intended drainage area for the existing stormwater BMPs is accurate or has been altered in any way.
- *Prioritization of BMP retrofits*: In the analysis it was found that several stormwater BMPs drain areas in excess of the BMPs' recommended drainage areas. Using the GIS and remote-sensing data, the BMPs that are draining excessive acreage can be identified and prioritized for retrofit.
- *Prioritization of BMP-maintenance efforts*: Drainage areas are calculated for each wet and dry pond in the inventory. Those BMPs receiving a large volume of runoff need to be maintained more frequently. This tool enables state and local jurisdictions to target maintenance efforts more efficiently, focusing maintenance on those BMPs draining areas in excess of the recommended drainage area.
- *Assistance in the assessment of subdivision drainage*: It is possible to analyze the efficacy of *in situ* stormwater measures to address runoff associated with subdivisions.

Data Gaps/Difficulties

While working through the various stages of this project, WRA discovered several barriers to a complete assessment of the impact of stormwater BMPs in the Christina Basin. WRA found that it is essential to address the existing data gaps in order to improve the overall quality of future projects related to stormwater BMPs. These data gaps are outlined below:

- *Types of BMPs*: This project includes an analysis of wet and dry ponds. It was not possible to include several stormwater BMPs, such as rain gardens, filter strips, constructed wetlands, porous pavement, and bioswales in this analysis. These

types of BMPs were not included in this project because a comprehensive inventory is not available and these types of BMPs are difficult to detect visually using GIS and remote-sensing data.
- *Incomplete wet- and dry-pond BMP inventory*: Not all wet and dry ponds are contained in the inventory. Some were apparent in the imagery but did not appear in the inventory. These BMPs were not included in the analysis.
- *Missing BMP data*: The BMP database is not comprehensive. The database contains the wet- and dry-pond BMPs located in New Castle County, but BMPs contained in independent jurisdictions is not available. For example, data were not available for any stormwater BMPs in Wilmington, Newport, or Elsmere, which all lie partially or completely within the Christina Basin.
- *Partial BMP data*: The information provided for each BMP in the database varies considerably. For example, the BMPs installation dates are not available for all of the BMPs, the terminology used to describe the BMP is inconsistent, and the drainage area for each BMP is not available.
- *Bacteria reductions*: The data available for bacteria reduction values are limited. For the purposes of this project, WRA used a zero-bacteria reduction value for dry ponds and range of 44–99 percent for wet ponds. Continued research and data collection are necessary to further refine these values, a recommendation included in the Christina Basin Pollution Control Strategy.

Future Projects

Several prospective projects were discussed and will be considered as opportunities for future DNREC and WRA collaborations. Future initiatives may include applying this analysis to watersheds throughout the state, identifying and developing a database of parking lots in the Christina Basin, and developing a procedure to standardize the data, input formats, and consistent terminology for stormwater BMPs statewide. Pursuing these and other related projects will provide DNREC with the data and analysis necessary for the state to continue progress toward meeting the TMDLs established in watersheds throughout the state.

V. Tables

Subdiv Name	Subdiv Acres	BMP Acres	Pond Type	Pond Code	BMP ID	Subdiv ID	Intersected Acres	Acres Subdiv Drained By BMP	Acres Subdiv Not Drained by BMP	Acres BMP Outside Subdiv
ARTCRAFT ELECTRIC SUPPLY	3.75	0.68	Dry	1	1096	198	0.68	0.68	3.07	0.00
ASTRZENECA	5.06	4.75	Dry	1	573	214	2.08	2.08	2.98	2.67
AUGUSTINE RIDGE	23.72	24.24	Dry	1	495	215	17.14	17.14	6.59	7.10
BRANDYWINE COMMONS 2	120.67	3.13	Wet	2	546	205	1.71	1.71	118.96	1.42
BRANDYWINE COMMONS 2	120.67	29.96	Wet	2	547	205	27.40	27.40	93.26	2.56
BRANDYWINE HUNT	110.21	178.57	Wet	2	549	209	95.88	95.88	14.34	82.69
BRANDYWINE TOWN CENTER	98.68	0.71	Dry	1	550	191	0.71	0.71	97.97	0.00
BRANDYWINE VALLEY BAPTIST CHURCH	4.02	0.03	Dry	1	1129	202	0.03	0.03	3.99	0.00
CARPENTERS ROW	6.25	0.70	Dry	1	575	216	0.59	0.59	5.66	0.11
CENTERVILLE SCHOOL	11.97	2.72	Dry	1	584	212	2.72	2.72	9.25	0.00
CENTERVILLE SCHOOL	11.97	0.05	Wet	2	585	212	0.05	0.05	11.93	0.00
CONCORD SQUARE PHASE II	33.69	17.45	Dry	1	631	199	17.28	17.28	16.42	0.18
COUNTRY GATES	10.51	8.04	Dry	1	642	192	6.65	6.65	3.86	1.39
DOUBLE TREE INN	5.15	0.08	Dry	1	669	217	0.05	0.05	5.09	0.03
E I DUPONT DEMEMOURS & CO	592.63	1.43	Wet	2	1133	213	1.43	1.43	591.20	0.00
FIRST UNITARIAN CHURCH	8.22	3.50	Dry	1	424	194	2.84	2.84	5.37	0.66
HATFIELD RICHARD G & AUDREY B	5.84	3.26	Dry	1	62	20000	2.10	2.10	3.74	1.15
I N A PROPERTIES OF DELAWARE	23.34	6.65	Dry	1	1087	203	6.65	6.65	16.69	0.00
MCINTOSH INN OF WILMINGTON INC	4.44	3.87	Dry	1	293	208	2.66	2.66	1.78	1.21
MONTCHANIN VILLAGE INN	5.36	1.36	Dry	1	1009	204	1.36	1.36	4.00	0.00
PONDS AT GREENVILLE	19.60	6.22	Wet	2	195	210	5.21	5.21	14.40	1.01
PRESIDENTIAL ESTATES	15.67	14.73	Wet	2	272	195	8.55	8.55	7.12	6.18
ST MARY MAGDALEN CATHOLIC CHURCH	8.68	5.60	Dry	1	217	211	4.83	4.83	3.86	0.77
STONEGATES	38.50	0.21	Dry	1	63	200	0.21	0.21	38.29	0.00
VERSAILLES	58.76	148.13	Dry	1	134	207	10.35	10.35	48.41	137.78
VERSAILLES	58.76	8.26	Dry	1	135	207	8.26	8.26	50.50	0.00
VERSAILLES	58.76	5.01	Dry	1	136	207	4.09	4.09	54.67	0.92
VILLAGE OF ROCKY RUN	24.76	9.78	Wet	2	139	196	9.34	9.34	15.42	0.43
WILMINGTON FRIENDS SCHOOL	24.75	1.13	Dry	1	82	201	1.13	1.13	23.62	0.00

Table 5.1 Summary of acres of subdivisions treated by wet and dry ponds in the Brandywine River watershed.

Subdiv Name	Subdiv Acres	BMP Acres	Pond Type	Pond Code	BMP ID	Subdiv ID	Intersected Acres	Acres Subdiv Drained by BMP	Acres Subdiv Not Drained by BMP	Acres BMP Outside Subdiv
BRECKENRIDGE	43.42	18.85	Wet	2	553	190	12.33	12.33	31.10	6.53
CENTERVILLE RESERVE	73.46	16.40	Dry	1	582	183	16.40	16.40	57.06	0.00
CENTERVILLE RESERVE	73.46	7.32	Dry	1	583	183	7.32	7.32	66.14	0.00
COKESBURY VILLAGE	53.52	22.82	Wet	2	854	163	16.99	16.99	36.53	5.83
COKESBURY VILLAGE	53.52	124.64	Wet	2	907	163	29.02	29.02	24.50	95.62
DELCASTLE FARMS	409.00	7.92	Dry	1	479	180	7.92	7.92	401.08	0.00
DEPOT	5.84	0.50	Wet	2	193	152	0.50	0.50	5.34	0.00
FIELDSTONE GOLF CLUB	184.88	10.77	Wet	2	685	158	10.53	10.53	174.35	0.24
FIELDSTONE GOLF CLUB	184.88	36.18	Wet	2	686	158	36.18	36.18	148.70	0.00
FIELDSTONE GOLF CLUB	184.88	22.45	Wet	2	687	158	22.45	22.45	162.44	0.00
FIRST CHOICE CLEANING SERVICES	0.56	0.38	Dry	1	689	157	0.27	0.27	0.29	0.11
FOX HOLLOW	32.97	48.24	Wet	2	436	174	28.19	28.19	4.78	20.05
GRACE LUTHERAN CHURCH	3.71	5.17	Dry	1	453	185	1.32	1.32	2.40	3.86
GREENBANK CORPORATION	1.98	0.69	Dry	1	1144	184	0.54	0.54	1.44	0.14
HAWTHORNE	33.55	23.57	Dry	1	380	187	12.08	12.08	21.48	11.49
HAWTHORNE	33.55	4.16	Dry	1	382	187	4.03	4.03	29.53	0.13
HERCULES RESEARCH CENTER AND COUNTRY CLUB	556.76	1.38	Dry	1	83	164	1.38	1.38	555.38	0.00
HOCKESSIN GLEN	18.58	21.19	Dry	1	393	154	9.72	9.72	8.86	11.47
KINDERCARE	13.91	4.27	Dry	1	414	171	3.56	3.56	10.35	0.71
KOREAN UM CHURCH	3.22	0.78	Dry	1	417	159	0.78	0.78	2.44	0.00
LIMESTONE MEDICAL CENTER	7.74	0.96	Dry	1	349	170	0.89	0.89	6.85	0.07
LITTLE FALLS VILLAGE	17.13	31.32	Dry	1	353	189	12.86	12.86	4.27	18.46
LITTLE FALLS VILLAGE	6.81	2.33	Dry	1	869	172	1.87	1.87	4.94	0.45
METHODIST COUNTRY HOUSE	76.83	4.01	Dry	1	304	186	4.01	4.01	72.82	0.00
MITCH ROAD MEDICAL BLDG	1.34	0.10	Wet	2	314	161	0.10	0.10	1.23	0.00
MITCHELL ESTATES	26.72	8.64	Dry	1	29	181	8.64	8.64	18.07	0.00
NATIONAL ASSISTED LIVING P	3.56	1.11	Dry	1	87	175	1.06	1.06	2.50	0.05
OWLS RIDGE	16.73	1.72	Dry	1	252	173	0.77	0.77	15.96	0.95
RAMSEY RIDGE	167.93	182.58	Wet	2	276	178	120.25	120.25	47.68	62.33
ROCCO AUTOMOTIVE	2.62	0.77	Dry	1	201	176	0.76	0.76	1.86	0.01
SELVAGGIO CHARLES ET AL	10.38	53.40	Dry	1	28	155	6.63	6.63	3.75	46.78
SHOPPES OF STANTON	1.86	1011.67	Dry	1	889	156	0.80	0.80	1.06	1010.87
SITE DEVELOPMENT INC	3.42	0.04	Dry	1	1074	162	0.04	0.04	3.37	0.00
ST.BARNABAS EPISCOPAL CHURCH	6.21	2.11	Dry	1	155	160	1.54	1.54	4.67	0.57
STATE FARM MUTUAL AUTOMOBILE	4.29	3.52	Dry	1	159	169	2.52	2.52	1.77	1.00

Table 5.2 Summary of acres of subdivisions treated by wet and dry ponds in the Red Clay Creek watershed.

Subdiv Name	Subdiv Acres	BMP Acres	Pond Type	Pond Code	BMP ID	Subdiv ID	Intersected Acres	Acres Subdiv Drained by BMP	Acres Subdiv Not Drained by BMP	Acres BMP Outside Subdiv
STONEWOLD	165.72	19.93	Wet	2	166	168	19.93	19.93	145.79	0.00
STONEWOLD	165.72	11.78	Wet	2	167	168	11.78	11.78	153.94	0.00
STONEWOLD	165.72	12.26	Wet	2	168	168	12.26	12.26	153.46	0.00
STONEWOLD	165.72	6.35	Wet	2	169	168	6.35	6.35	159.37	0.00
STONEWOLD	165.72	9.39	Wet	2	170	168	9.39	9.39	156.33	0.00
STONEWOLD	165.72	11.73	Wet	2	171	168	11.73	11.73	153.99	0.00
TALL TREES	5.71	1.08	Dry	1	187	151	0.72	0.72	4.98	0.35
TALL TREES	5.71	1.30	Dry	1	188	151	1.28	1.28	4.42	0.02
THOMAS POINTE	11.28	3.36	Dry	1	113	179	3.07	3.07	8.22	0.30
THORNBERRY	14.17	0.55	Wet	2	114	177	0.55	0.55	13.63	0.00
TRUITT FARM	10.88	9.13	Dry	1	27	166	7.52	7.52	3.35	1.61
UNITED STOR-ALL CENTERS INC	5.74	5.41	Dry	1	127	165	3.52	3.52	2.22	1.90
WEST RIDING	55.04	10.05	Dry	1	30	167	9.77	9.77	45.27	0.27
WYNDOM	34.82	17.52	Wet	2	100	153	17.42	17.42	17.40	0.10
	59.91	12.38	Dry	1	1186	182	11.66	11.66	48.26	0.72

Table 5.2 (continued)

Subdiv Name	Subdiv Acres	BMP Acres	Pond Type	Pond Code	BMP ID	Subdiv ID	Intersected Acres	Acres Subdiv Drained By BMP	Acres Subdiv Not Drained by BMP	Acres BMP outside Subdiv
1082 OFFICE BUILDING	1.03	1.87	Dry	1	464	86	0.79	0.79	0.24	1.08
48 WEST PARK PLACE	1.51	0.84	Dry	1	10098	503	0.47	0.47	1.04	0.37
A M C HOUSING	3.90	0.26	Dry	1	10018	509	0.26	0.26	3.64	0.00
A M C HOUSING	3.90	0.39	Dry	1	10019	509	0.39	0.39	3.51	0.00
ADARE VILLAGE	10.80	9.72	Dry	1	1142	108	6.58	6.58	4.22	3.13
ALTERNATIVE LIVING SERVICES EA	3.81	4.35	Dry	1	478	81	3.23	3.23	0.58	1.12
ALTERNATIVE LIVING SERVICES EA	5.70	5.83	Dry	1	480	52	3.57	3.57	2.12	2.26
ALTERSGATE	4.71	3.02	Dry	1	4	139	2.34	2.34	2.37	0.68
APEX MEDICAL CENTER	10.25	4.98	Dry	1	1007	70	4.61	4.61	5.64	0.36
ASSOCIATION PLAN CONCEPTS INC	5.96	1.24	Dry	1	420	71	1.15	1.15	4.81	0.09
ASTRO POWER BUILDING	7.15	0.59	Dry	1	10075	474	0.59	0.59	6.56	0.00
AUTUMNWOOD	85.93	62.25	Wet	2	496	150	50.05	50.05	35.87	12.20
BEECH HILL	150.66	1.11	Dry	1	530	62	1.11	1.11	149.55	0.00
BELLE TERRE	71.82	56.63	Dry	1	531	63	33.85	33.85	37.97	22.78
BELVEDERE FIRE CO	2.35	1.05	Dry	1	1118	127	0.09	0.09	2.27	0.97
BIRCH POINTE CONDOMINIUMS	21.95	6.61	Dry	1	533	100	3.07	3.07	18.88	3.54
BIRCH POINTE CONDOMINIUMS	21.95	20.80	Dry	1	534	100	12.59	12.59	9.35	8.21
BUFORD MANLOVE GARDENS	5.24	3.86	Dry	1	569	126	1.97	1.97	3.27	1.89
CASTLE PROPERTIES SITE	18.68	34.52	Dry	1	924	15	18.10	18.10	0.57	16.41
CATAWBA PROPERTY	11.04	0.37	Wet	2	540	7	0.37	0.37	10.67	0.00
CATAWBA PROPERTY	11.04	19.37	Wet	2	541	7	2.82	2.82	8.22	16.55
CENTER POINTE PLAZA PHASE 2	71.90	41.57	Wet	2	581	32	40.83	40.83	31.06	0.74
CENTER POINTE PLAZA PHASE 2	71.90	1.41	Wet	2	1111	32	1.41	1.41	70.49	0.00
CENTER POINTE PLAZA PHASE 2	71.90	0.40	Wet	2	1112	32	0.40	0.40	71.50	0.00
CHARTER OAKS SEC 2	52.82	31.91	Dry	1	14	43	17.95	17.95	34.87	13.97
CHESTNUT VALLEY	118.50	6.82	Dry	1	597	11	5.90	5.90	112.60	0.92
CHESTNUT VALLEY	118.50	3.33	Dry	1	598	11	3.32	3.32	115.18	0.00
CHESTNUT VALLEY	118.50	110.20	Dry	1	599	11	36.34	36.34	82.16	73.86
CHRISTIANA CARE HEALTH	200.03	91.86	Wet	2	607	133	91.49	91.49	108.53	0.37
CHRISTIANA CARE HEALTH	200.03	44.92	Wet	2	608	133	44.92	44.92	155.10	0.00
CHRISTIANA CARE HEALTH SYSTEM	15.84	21.72	Wet	2	922	49	3.94	3.94	11.90	17.78
CHRISTIANA EXECUTIVE CAMPUS	54.47	27.91	Wet	2	601	4	19.31	19.31	35.17	8.61
CHRISTIANA EXECUTIVE CAMPUS	54.47	3.12	Dry	1	1177	4	3.12	3.12	51.36	0.00
CHRISTIANA HOTEL	1.48	0.15	Wet	2	609	19	0.15	0.15	1.33	0.00
CHRYSLER CORPORATION	16.60	1.79	Dry	1	10091	471	1.79	1.79	14.81	0.00

Table 5.3 Summary of acres of subdivisions treated by wet and dry ponds in the White Clay Creek watershed.

Table 5.3 (continued)

Subdiv Name	Subdiv Acres	BMP Acres	Pond Type	Pond Code	BMP ID	Subdiv ID	Intersected Acres	Acres Subdiv Drained By BMP	Acres Subdiv Not Drained by BMP	Acres BMP outside Subdiv
COLLEGE SQUARE SHOPPING CENTER	56.15	26.67	Dry	1	10025	504	26.67	26.67	29.48	0.00
COLLEGE SQUARE SHOPPING CENTER	56.15	10.49	Wet	2	10047	504	1.09			
COTSWOLD HILLS	127.23	56.24	Dry	1	640	117	56.24	56.24	70.99	0.00
COTSWOLD HILLS	127.23	6.06	Dry	1	641	117	6.06	6.06	121.17	0.00
CROSSAN POINTE	17.46	9.38	Dry	1	47	96	9.36	9.36	8.10	0.02
DEER RUN	3.23	2.50	Wet	2	10044	460	1.71	1.71	1.52	0.79
DEERFIELD	24.78	20.14	Dry	1	20	140	14.66	14.66	10.12	5.47
DEERFIELD GOLF & TENNIS CLUB	181.44	2.21	Dry	1	659	54	2.21	2.21	179.23	0.00
DELAWARE TECHNOLOGY PARK	13.13	10.49	Wet	2	10047	440	2.45	2.45	10.68	8.04
DELAWARE TECHNOLOGY PARK	27.49	26.75	Wet	2	10017	485	14.57	14.57	12.92	12.18
DELAWARE TECHNOLOGY PARK	27.49	10.49	Wet	2	10047	485	6.95			
DELAWARE TECHNOLOGY PARK	32.83	0.49	Wet	2	10083	437	0.49	0.49	32.33	0.00
DRUMMOND FARMS	31.87	38.26	Dry	1	670	103	22.78	22.78	9.09	15.48
DRUMMOND PLAZA OFFICE PARK	8.08	16.54	Wet	2	671	144	5.30	5.30	2.78	11.24
DSEA	4.70	1.62	Dry	1	647	120	1.62	1.62	3.09	0.00
DUPONT ELASTMOERS	6.76	6.37	Dry	1	672	23	1.94	1.94	4.82	4.43
E I DUPONT DENEMOURS & COMPANY	76.47	5.75	Dry	1	571	34	5.74	5.74	70.73	0.01
ENGLISH CREEK	19.17	12.98	Dry	1	676	99	10.58	10.58	8.59	2.40
ESTATES OF CORNER KETCH	103.80	85.75	Dry	1	677	16	41.38	41.38	62.42	44.36
ESTATES OF CORNER KETCH	103.80	17.87	Dry	1	678	16	16.44	16.44	87.37	1.43
EVERGREEN	17.84	8.74	Dry	1	10050	462	8.41	8.41	9.42	0.33
FAIRFIELD	151.46	1.20	Wet	2	10077	446	1.20	1.20	150.27	0.00
FIRST STATE INDUSTRIAL PARK	83.30	0.58	Dry	1	465	102	0.58	0.58	82.72	0.00
FIRST STATE INDUSTRIAL PARK	83.30	1.34	Dry	1	997	102	1.34	1.34	81.97	0.00
FMC CORPORATION	27.32	0.21	Wet	2	679	87	0.21	0.21	27.10	0.00
FOUNTIANVIEW APARTMENTS	18.00	7.74	Wet	2	10000	451	7.74	7.74	10.26	0.00
FOX FIRE	35.10	15.89	Dry	1	435	44	15.72	15.72	19.38	0.17
GENERAL FOODS CORPORATION	22.50	1.68	Dry	1	929	3	1.68	1.68	20.83	0.00
HAMPTON POINTE	22.51	0.35	Wet	2	460	106	0.35	0.35	22.16	0.00
HARMONY CREST SEC 3	150.17	232.98	Dry	1	34	92	114.58	114.58	35.59	118.40
HENDERSON PLACE	21.29	2.28	Dry	1	386	39	2.28	2.28	19.00	0.00
HILLS OF HOCKESSIN	20.00	5.53	Dry	1	387	60	5.53	5.53	14.47	0.00
HINDU TEMPLE ASSOCIATION, INC.	4.91	1.77	Wet	2	388	69	1.77	1.77	3.14	0.00
HITCHENS FARM	103.48	17.25	Wet	2	45	121	17.25	17.25	86.22	0.00
HOCKESSIN CHASE	137.32	22.21	Wet	2	390	104	20.35	20.35	116.97	1.86

Subdiv Name	Subdiv Acres	BMP Acres	Pond Type	Pond Code	BMP ID	Subdiv ID	Intersected Acres	Acres Subdiv Drained By BMP	Acres Subdiv Not Drained by BMP	Acres BMP outside Subdiv
HOCKESSIN CHASE	137.32	31.97	Wet	2	391	104	31.97	31.97	105.35	0.00
HOCKESSIN CHASE	137.32	27.47	Wet	2	443	104	26.31	26.31	111.01	1.16
HOCKESSIN CORNER	6.38	37.95	Dry	1	392	74	6.16	6.16	0.22	31.79
HOCKESSIN CROSSING	3.18	533.42	Dry	1	73	5	0.22	0.22	2.97	533.21
HOCKESSIN GLEN	18.58	10.76	Dry	1	394	6	7.41	7.41	11.16	3.34
HOCKESSIN GREENE	53.55	40.55	Dry	1	395	29	39.95	39.95	13.60	0.61
HOCKESSIN HUNT	93.27	24.90	Dry	1	398	64	15.00	15.00	78.27	9.90
HOCKESSIN HUNT	93.27	2.86	Dry	1	399	64	2.38	2.38	90.89	0.48
HOCKESSIN PARK	18.15	3.09	Dry	1	381	55	3.09	3.09	15.06	0.00
HUNT AT LOUVIERS	156.92	5.45	Dry	1	10057	482	5.45	5.45	151.47	0.00
HUNT AT LOUVIERS	156.92	1.30	Dry	1	10058	482	1.30	1.30	155.62	0.00
HUNT AT LOUVIERS	156.92	1.29	Dry	1	10059	482	1.29	1.29	155.62	0.00
HUNTERS RIDGE	50.03	40.04	Wet	2	403	82	35.83	35.83	14.20	4.21
INDEPENDENCE SCHOOL	74.73	3.71	Dry	1	404	61	3.71	3.71	71.03	0.00
INDEPENDENCE SCHOOL	74.73	0.59	Wet	2	405	61	0.59	0.59	74.14	0.00
JARRELL FARMS SEC 3	58.83	19.70	Dry	1	17	59	13.29	13.29	45.54	6.42
JENNYS RUN	13.89	0.62	Dry	1	10066	490	0.62	0.62	13.28	0.00
KENTMERE	9.86	1.52	Dry	1	412	46	1.50	1.50	8.36	0.02
KERSHAW COMMONS	1.99	0.71	Dry	1	10067	497	0.71	0.71	1.28	0.00
LA PETITE ACADEMY INC	2.65	1.49	Dry	1	1023	148	0.58	0.58	2.07	0.91
LANDING	7.39	61.87	Dry	1	418	84	4.41	4.41	2.98	57.46
LANTANA SQUARE	44.05	95.38	Wet	2	333	2	1.30	1.30	42.74	94.07
LANTANA SQUARE	44.05	15.77	Dry	1	334	2	4.76	4.76	39.29	11.02
LANTANA SQUARE	44.05	0.59	Dry	1	335	2	0.59	0.59	43.45	0.00
LANTANA SQUARE	44.05	1.40	Dry	1	419	2	1.38	1.38	42.67	0.02
LAURAS GLEN	4.66	1.87	Dry	1	10002	456	1.87	1.87	2.79	0.00
LICKLE DANIEL C	1.32	5.12	Dry	1	648	114	0.94	0.94	0.38	4.18
LIME CREEK PROFESSIONAL CENTER	6.93	0.78	Dry	1	1125	91	0.78	0.78	6.15	0.00
LIMESTONE HILLS PHASE 5	480.61	0.52	Wet	2	346	72	0.52	0.52	480.09	0.00
LIMESTONE HILLS PHASE 5	480.61	48.65	Dry	1	347	72	48.57	48.57	432.03	0.07
LIMESTONE HILLS PHASE 16	140.89	6.18	Wet	2	348	109	6.18	6.18	134.71	0.00
LINDEN HILL SHOPPES & OFFICES	11.10	0.68	Dry	1	230	93	0.67	0.67	10.43	0.02
LINDEN WAY	20.13	9.10	Dry	1	350	9	1.54	1.54	18.59	7.56
LINDEN WAY	20.13	2.28	Dry	1	351	9	2.28	2.28	17.84	0.00
LOWES	21.99	5.99	Wet	2	1166	94	5.99	5.99	16.00	0.00

Table 5.3 (continued)

Subdiv Name	Subdiv Acres	BMP Acres	Pond Type	Pond Code	BMP ID	Subdiv ID	Intersected Acres	Acres Subdiv Drained By BMP	Acres Subdiv Not Drained by BMP	Acres BMP outside Subdiv
M B N A AMERICA	32.07	1.16	Wet	2	366	41	1.16	1.16	30.90	0.00
M B N A AMERICA	32.07	14.47	Dry	1	367	41	12.34	12.34	19.72	2.12
M B N A AMERICA	32.07	1.10	Dry	1	369	41	0.31	0.31	31.75	0.79
MANOR CARE	12.91	4.17	Dry	1	990	57	4.17	4.17	8.73	0.00
MARROWS ROAD ASSOC LLC	4.15	2.09	Wet	2	10031	432	0.33	0.33	3.82	1.76
MARROWS ROAD COMPLEX	6.98	0.84	Wet	2	10070	486	0.84	0.84	6.14	0.00
MATTEI CORPORATOIN	25.06	12.19	Wet	2	461	65	12.12	12.12	12.94	0.07
MAYFAIR	60.05	13.75	Dry	1	1002	145	12.79	12.79	47.25	0.96
MAYFAIR	60.05	10.06	Dry	1	1003	145	6.17	6.17	53.88	3.89
MBNA AMERICA AT CHRISTIANA CENTER	238.29	37.26	Wet	2	364	80	32.60	32.60	205.69	4.65
MBNA AMERICA AT CHRISTIANA CENTER	238.29	0.98	Dry	1	365	80	0.98	0.98	237.31	0.00
MEADOWDALE	66.84	0.46	Wet	2	18	123	0.46	0.46	66.38	0.00
MEADOWDALE	66.84	17.62	Wet	2	297	123	15.92	15.92	50.92	1.70
MEADOWDALE	66.84	21.11	Dry	1	1005	123	4.94	4.94	61.90	16.17
MENDENHALL VILLAGE	242.85	12.29	Dry	1	16	56	12.29	12.29	230.56	0.00
MENDENHALL VILLAGE	242.85	133.28	Dry	1	21	56	129.40	129.40	113.45	3.88
MERESTONE	28.69	14.94	Wet	2	302	13	8.00	8.00	20.69	6.94
METRO CENTER	20.97	4.28	Wet	2	305	129	0.90	0.90	20.08	3.38
METRO PROFESSIONAL OFFICES	5.63	1.50	Dry	1	306	77	1.49	1.49	4.14	0.01
MIDDLE RUN CROSSING	227.45	13.50	Wet	2	253	50	13.50	13.50	213.94	0.00
MIDDLE RUN CROSSING	227.45	39.63	Dry	1	307	50	34.60	34.60	192.84	5.03
MIDDLE RUN CROSSING	227.45	52.16	Dry	1	308	50	52.16	52.16	175.28	0.00
MIDDLE RUN CROSSING	227.45	21.06	Dry	1	309	50	21.06			
MIDDLE RUN MEADOW	8.26	7.64	Dry	1	10071	464	5.60	5.60	2.65	2.04
MILL AT WHITE CLAY	18.96	4.61	Wet	2	10022	479	1.30	1.30	17.66	3.31
MILLCROFT RETIREMENT & NURSING	7.21	5.10	Wet	2	311	47	4.77	4.77	2.44	0.32
MORGAN CHRISTIANA CENTER	166.52	350.03	Wet	2	408	42	86.12	86.12	80.40	263.92
MORNINGSIDE	59.01	136.19	Dry	1	46	105	56.36	56.36	2.66	79.83
NEWARK	7.42	7.95	Wet	2	10072	470	3.32	3.32	4.10	4.63
NEWARK	8.55	4.06	Wet	2	10021	493	3.55	3.55	5.00	0.52
NEWARK	78.58	4.32	Dry	1	10092	496	3.90	3.90	74.69	0.43
NEWARK 7	21.47	0.40	Wet	2	10039	442	0.40	0.40	21.07	0.00
NEWARK COMMONS	25.73	19.03	Wet	2	158	118	16.47	16.47	9.26	2.56
NEWARK FIRST ASSEMBLY OF GOD	6.23	4.29	Wet	2	319	53	4.06	4.06	2.18	0.23
NONANTUM MILLS	93.59	51.97	Dry	1	324	113	50.69	50.69	42.90	1.28

Table 5.3 (continued)

Subdiv Name	Subdiv Acres	BMP Acres	Pond Type	Pond Code	BMP ID	Subdiv ID	Intersected Acres	Acres Subdiv Drained By BMP	Acres Subdiv Not Drained by BMP	Acres BMP outside Subdiv
NORTHPOINTE AT LIMESTONE HILLS	108.71	21.80	Dry	1	326	67	21.80	21.80	86.91	0.00
NUCAR BUICK PONTIAC GMC	8.61	0.29	Wet	2	10023	443	0.29	0.29	8.32	0.00
OMEGA PROFESSIONAL CENTER V	12.74	9.90	Wet	2	248	76	3.93	3.93	8.81	5.96
ORCHARD COMMONS	4.61	0.58	Wet	2	250	142	0.58	0.58	4.02	0.00
ORTHOPEDIC PROPERTIES LLC	4.01	3.11	Dry	1	888	107	1.61	1.61	2.39	1.49
PAPERMILL FALLS	10.34	5.50	Wet	2	10024	481	5.24	10.34	5.09	0.26
PARISH OF THE RESURRECTION	13.95	0.24	Dry	1	254	141	0.24	0.24	13.71	0.00
PATTERSON FARM	100.65	20.51	Dry	1	454	27	17.79	17.79	82.85	2.71
PATTERSON FARM	100.65	45.71	Dry	1	455	27	32.32	32.32	68.32	13.39
PENN MANOR	177.74	69.84	Wet	2	12	75	68.71	68.71	109.03	1.13
PENN MANOR	177.74	13.70	Dry	1	13	75	13.70	13.70	164.05	0.00
PIERSONS RIDGE	65.92	22.67	Dry	1	128	137	0.72	0.72	65.20	21.95
PIERSONS RIDGE	65.92	19.62	Dry	1	267	137	16.87	16.87	49.05	2.75
PIKE CREEK GOLF COURSE	188.10	27.71	Wet	2	115	132	21.43	21.43	166.67	6.28
PIKE CREEK GOLF COURSE	188.10	71.88	Wet	2	116	132	13.23	13.23	174.88	58.66
PIKE CREEK GOLF COURSE	188.10	1.34	Wet	2	117	132	1.34	1.34	186.76	0.00
PIKE CREEK GOLF COURSE	188.10	1.70	Dry	1	118	132	0.78	0.78	187.32	0.92
PIKE CREEK GOLF COURSE	188.10	3.76	Wet	2	119	132	3.27	3.27	184.84	0.49
PIKE CREEK GOLF COURSE	188.10	12.24	Wet	2	120	132	11.67	11.67	176.44	0.58
PIKE CREEK SHOPPING CENTER	34.56	15.77	Wet	2	1163	89	15.16	15.16	19.40	0.61
PIKE CREEK SPORTS MEDICINE CTR	2.83	4.42	Dry	1	268	1	1.19	1.19	1.64	3.23
PIKE CREEK VALLEY OFFICE	9.14	8.01	Dry	1	301	111	1.53	1.53	7.61	6.48
PRICES SHOPS	11.74	15.47	Dry	1	274	26	10.09	10.09	1.64	5.38
PROFESSIONAL ASSOCIATES	4.91	3.64	Dry	1	462	22	1.56	1.56	3.35	2.07
RED MILL INDUSTRIAL PARK	20.67	4.30	Dry	1	279	125	4.20	4.20	16.47	0.10
RED ROOF INNS SITE	3.59	8.08	Dry	1	281	30	2.39	2.39	1.20	5.69
RICHARDS LANE	6.70	0.65	Dry	1	284	90	0.65	0.65	6.05	0.00
RICHARDS LANE	6.70	3.86	Dry	1	285	90	2.57	2.57	4.13	1.29
RIDGE	31.24	1.74	Wet	2	198	40	1.74	1.74	29.51	0.00
RIDGEWOOD GLEN	46.03	51.22	Dry	1	10011	492	8.64	8.64	37.39	42.58
RIDGEWOOD GLEN	46.03	36.69	Dry	1	10078	492	19.14	19.14	26.89	17.55
RUPP MARGARET TRACT	41.57	98.13	Wet	2	10033	444	36.75	36.75	4.82	61.38
RUTTER ESTATES	11.11	17.46	Wet	2	211	58	5.79	5.79	5.32	11.67
SADDLE RIDGE CROSSING	29.57	18.95	Wet	2	213	83	15.44	15.44	14.13	3.50
SADDLE RIDGE CROSSING	29.57	7.46	Dry	1	214	83	6.86	6.86	22.71	0.60

Table 5.3 (continued)

Subdiv Name	Subdiv Acres	BMP Acres	Pond Type	Pond Code	BMP ID	Subdiv ID	Intersected Acres	Acres Subdiv Drained By BMP	Acres Subdiv Not Drained by BMP	Acres BMP outside Subdiv
SANFORD RIDGE	53.89	10.91	Dry	1	221	138	10.91	10.91	42.98	0.00
SANFORD RIDGE	53.89	0.84	Dry	1	222	138	0.84	0.84	53.05	0.00
SCERNI INDUSTRIAL PARK	5.13	71.34	Dry	1	223	68	2.62	2.62	2.51	68.72
SCHWAB LLC	2.74	0.32	Wet	2	10013	448	0.32	0.32	2.42	0.00
SHELL OIL COMPANY	1.90	12.64	Dry	1	226	143	0.17	0.17	1.73	12.47
SHOPPES AT LOUVIERS	10.03	1.75	Wet	2	10009	478	1.75	1.75	8.29	0.00
SHOPPES OF HOCKESSIN	3.35	40.25	Dry	1	229	31	2.53	2.53	0.82	37.73
SOUTHWOOD ESTATES	45.72	26.82	Dry	1	234	21	17.83	17.83	27.90	9.00
SPORTS PLUS INDOOR RECREATION	16.62	4.32	Dry	1	592	124	3.96	3.96	12.66	0.36
STAFFORD II	42.21	23.97	Dry	1	44	51	22.99	22.99	19.22	0.98
STAFFORD II	42.21	0.40	Dry	1	10081	51	0.40	0.40	41.81	0.00
STAFFORD II	42.21	0.53	Dry	1	10082	51	0.53	0.53	41.68	0.00
STENNING WOODS	96.88	31.43	Dry	1	160	45	31.35	31.35	65.53	0.08
STENNING WOODS	96.88	32.65	Dry	1	161	45	32.65	32.65	64.23	0.00
STONEY CREEK PLAZA	5.44	3.02	Dry	1	172	24	0.30	0.30	5.14	2.72
STUYVESANT HILLS	47.23	36.00	Dry	1	15	85	25.78	25.78	21.45	10.22
SUNSET VALLEY	15.43	16.25	Wet	2	181	88	8.41	8.41	7.02	7.84
TEEKATT ASSOCIATES	2.88	4.94	Dry	1	961	134	1.73	1.73	1.15	3.21
TEMPLE BETH EL	10.46	0.52	Wet	2	10008	483	0.52	0.52	9.94	0.00
TRADERS ALLEY	1.74	0.28	Wet	2	10087	436	0.20	0.20	1.54	0.08
TUTOR TIME	3.14	0.24	Dry	1	124	36	0.24	0.24	2.90	0.00
UNIVERSITY COURTYARD	22.81	5.62	Wet	2	10029	476	5.49	5.49	17.32	0.13
UNIVERSITY COURTYARD	22.81	0.57	Wet	2	10030	476	0.57	0.57	22.24	0.00
UNIVERSITY OF DEL	5.76	0.28	Wet	2	10043	457	0.28	0.28	5.47	0.00
UNIVERSITY OF DEL	377.98	314.25	Wet	2	10049	459	107.82	107.82	270.16	206.43
UNIVERSITY OF DEL	377.98	2.09	Wet	2	10088	459	2.09	2.09	375.89	0.00
UNIVERSITY OF DELAWARE	4.21	0.56	Wet	2	10012	495	0.55	0.55	3.66	0.01
UNIVERSITY OF DELAWARE	123.06	0.24	Wet	2	10056	447	0.24	0.24	122.81	0.00
VALLEBROOK	36.87	22.67	Dry	1	128	135	21.33	21.33	15.54	1.35
VALLEY CORPORATE CENTER	4.37	8.23	Dry	1	212	14	0.72	0.72	3.65	7.52
VALLEY POINTE	8.70	3.70	Dry	1	129	146	3.00	3.00	5.70	0.70
VILLAGE OF PLUM RUN	23.38	18.53	Wet	2	138	131	2.73	2.73	20.65	15.80
W L GORE & ASSOCIATES INC	161.72	8.15	Wet	2	151	48	8.14	8.14	153.58	0.01
WALDEN	48.37	18.67	Dry	1	920	17	17.66	17.66	30.70	1.01
WEATHERHILL FARMS	10.77	19.42	Dry	1	70	66	10.23	10.23	0.54	9.19

Table 5.3 (continued)

Subdiv Name	Subdiv Acres	BMP Acres	Pond Type	Pond Code	BMP ID	Subdiv ID	Intersected Acres	Acres Subdiv Drained By BMP	Acres Subdiv Not Drained by BMP	Acres BMP outside Subdiv
WESTWOODS	101.02	46.29	Dry	1	76	95	36.74	36.74	64.28	9.55
WESTWOODS	101.02	15.18	Dry	1	77	95	15.18	15.18	85.84	0.00
WHITEBRIAR	25.64	29.84	Wet	2	78	98	17.17	17.17	8.47	12.67
WHITECHAPEL	6.83	6.22	Dry	1	10102	433	2.72	2.72	4.11	3.50
WHITECHAPEL	20.48	54.81	Wet	2	10095	472	18.32	18.32	2.17	36.50
WILLIAM H PORTER INC	12.15	0.25	Wet	2	10074	466	0.25	0.25	11.91	0.00
WILMINGTON CHRISTIAN SCHOOL INC	15.54	7.55	Dry	1	80	8	6.71	6.71	8.83	0.84
WINDING BRIDGE	22.10	23.63	Wet	2	86	130	6.85	6.85	15.25	16.78
WINDING BRIDGE	22.10	3.20	Dry	1	901	130	3.17	3.17	18.93	0.03
WINNER INFINITI	16.20	12.17	Dry	1	88	12	11.64	11.64	4.56	0.53
WOOD CREEK SEC 1	183.07	38.60	Dry	1	19	97	38.60	38.60	144.47	0.00
WOOD CREEK SEC 1	183.07	46.62	Dry	1	22	97	29.30	29.30	153.78	17.32
WOOD CREEK SEC 1	183.07	495.51	Dry	1	207	97	33.25	33.25	149.82	462.26
WOODCREST COURT	2.83	4.86	Dry	1	92	28	2.16	2.16	0.67	2.70
WOODMILL	31.79	5.99	Dry	1	998	20	4.02	4.02	27.76	1.97
WOODS AT LIMESTONE HILLS	26.32	31.24	Wet	2	109	18	16.21	16.21	10.11	15.02
WOODS AT LOUVIERS	74.59	1.13	Wet	2	10032	461	1.07	1.07	73.52	0.06
WOODS AT LOUVIERS	74.59	6.25	Wet	2	10036	461	4.57	4.57	70.02	1.67
WOODS AT LOUVIERS	74.59	7.88	Wet	2	10107	461	7.73	7.73	66.86	0.15
WOODS AT MIDDLE RUN	7.23	3.04	Dry	1	96	35	3.04	3.04	4.19	0.00
WYNCLIFF	14.82	0.99	Wet	2	10006	487	0.99	0.99	13.83	0.00
WYNNS GOODYEAR TIRE & SERVICE	1.35	55.27	Dry	1	103	79	0.91	0.91	0.44	54.36

Table 5.3 (continued)

Subdiv Name	Subdiv Acres	BMP Acres	Pond Type	Pond Code	BMP ID	Subdiv ID	Intersected Acres	Acres Subdiv Drained By BMP	Acres Subdiv Not Drained by BMP	Acres BMP Outside Subdiv
750 OTTS CHAPEL ROAD	16.64	5.88	Dry	1	150	284	3.40	3.40	13.24	2.48
ABBOTSFORD	70.37	0.98	Dry	1	10014	484	0.88	0.88	69.49	0.10
ABBOTSFORD	70.37	12.81	Dry	1	10053	484	12.81	12.81	57.56	0.00
ABBOTSFORD	70.37	7.94	Dry	1	10062	484	7.94	7.94	62.43	0.00
ACADEMY HILL PHASE IV	201.18	30.37	Wet	2	468	269	30.37	30.37	170.80	0.00
ACADEMY HILL PHASE IV	201.18	21.54	Wet	2	469	269	19.12	19.12	182.05	2.42
ACADEMY HILL PHASE IV	201.18	3.32	Wet	2	470	269	3.32	3.32	197.85	0.00
ASTRAZENECA NEWARK	146.78	9.33	Wet	2	490	392	9.20	9.20	137.58	0.12
ASTRAZENECA NEWARK	146.78	7.43	Dry	1	491	392	7.43	7.43	139.35	0.00
ASTRAZENECA NEWARK	146.78	0.58	Wet	2	492	392	0.58	0.58	146.19	0.00
ATLANTIC BUSINESS PARK PHASE 1,2	20.81	14.43	Wet	2	493	355	13.46	13.46	7.35	0.97
BARLEY MILL	63.22	12.78	Wet	2	32	220	12.78	12.78	50.44	0.00
BARLEY MILL	63.22	21.18	Wet	2	513	220	16.04	16.04	47.19	5.14
BARLEY MILL PLAZA SEC 4 & 6	121.53	195.61	Dry	1	514	294	4.90	4.90	116.63	190.71
BARLEY MILL PLAZA SEC 4 & 6	121.53	1.42	Dry	1	897	294	1.42	1.42	120.12	0.00
BARRETT RUN	111.89	15.79	Dry	1	515	336	11.73	11.73	100.16	4.06
BARRETT RUN	111.89	13.83	Dry	1	516	336	13.83	13.83	98.06	0.00
BARRETT RUN	111.89	5.38	Dry	1	517	336	5.38	5.38	106.52	0.00
BARRETT RUN	111.89	9.99	Dry	1	518	336	8.37	8.37	103.52	1.62
BARRINGTON	88.38	63.21	Wet	2	519	339	18.06	18.06	70.32	45.15
BARRINGTON	88.38	43.42	Wet	2	520	339	11.79	11.79	76.59	31.63
BASIN ROAD CONDO	6.05	4.00	Dry	1	521	359	2.54	2.54	3.51	1.45
BAYSHORE TRANSPORTATION	5.19	1.72	Dry	1	666	296	1.56	1.56	3.64	0.16
BEAULIEU II	54.31	4.46	Dry	1	527	253	4.46	4.46	49.85	0.00
BEAULIEU II	54.31	13.58	Wet	2	528	253	13.26	13.26	41.05	0.32
BECKS WOODS	82.84	297.55	Wet	2	54	389	12.00	12.00	70.84	285.55
BECKS WOODS	82.84	1.62	Dry	1	529	389	1.60	1.60	81.24	0.02
BECKS WOODS	82.84	27.75	Wet	2	858	389	27.73	27.73	55.10	0.01
BELLWETHER MANOR	3.89	2.80	Dry	1	532	279	2.74	2.74	1.15	0.06
BLUE HEN INDUSTRIAL PARK	16.04	0.58	Dry	1	60	421	0.58	0.58	15.47	0.00
BLUE HEN INDUSTRIAL PARK	16.04	4.52	Dry	1	61	421	4.52	4.52	11.52	0.00
BLUE HEN INDUSTRIAL PARK	16.04	1.17	Dry	1	921	421	1.09	1.09	14.95	0.09
BOULDEN INTERCHANGE PARK	79.59	13.91	Wet	2	542	364	13.49	13.49	66.10	0.42
BOULDEN INTERCHANGE PARK	79.59	3.92	Wet	2	544	364	3.25	3.25	76.35	0.67

Table 5.4 Summary of acres of subdivisions treated by wet and dry ponds in the Christina River watershed.

Table 5.4 (continued)

Subdiv Name	Subdiv Acres	BMP Acres	Pond Type	Pond Code	BMP ID	Subdiv ID	Intersected Acres	Acres Subdiv Drained By BMP	Acres Subdiv Not Drained by BMP	Acres BMP Outside Subdiv
BOYS & GIRLS CLUB OF DELAWARE	9.06	0.75	Dry	1	545	299	0.75	0.75	8.30	0.00
BRIARCREEK	11.42	7.47	Wet	2	10010	434	7.33	7.33	4.09	0.14
BROOKFIELD	20.95	11.31	Dry	1	565	378	9.46	9.46	11.49	1.85
CARAVEL EAST SEC 2	94.82	119.28	Dry	1	40	340	35.26	35.26	59.55	84.02
CASHO MILL STATION AT CASHO MILL	3.43	1.33	Wet	2	10038	454	1.33	1.33	2.09	0.00
CASTLEBAR	12.45	5.80	Dry	1	577	373	4.78	4.78	7.67	1.02
CATHOLIC DIOCESE FOUNDATION	20.44	7.78	Wet	2	354	315	7.78	7.78	12.65	0.00
CENTENNIAL VILLAGE	76.39	11.15	Dry	1	579	358	11.15	11.15	65.24	0.00
CENTENNIAL VILLAGE	76.39	0.82	Dry	1	580	358	0.82	0.82	75.57	0.00
CHAPMAN WOODS	24.82	14.48	Wet	2	591	308	14.07	14.07	10.75	0.41
CHESTNUT HILL PLAZA	21.78	0.93	Dry	1	1006	222	0.93	0.93	20.84	0.00
CHRISTIANA FARMS	24.58	6.83	Wet	2	602	264	5.97	5.97	18.61	0.86
CHRISTIANA GREEN	37.91	19.52	Wet	2	606	233	18.83	18.83	19.08	0.69
CHRISTIANA GREEN	37.91	1.14	Dry	1	1038	233	1.14	1.14	36.77	0.00
CHRISTIANA MALL	139.88	2.74	Dry	1	612	245	2.72	2.72	137.16	0.02
CHRISTIANA MALL	139.88	1.71	Dry	1	613	245	1.71	1.71	138.18	0.00
CHRISTIANA MEADOWS	77.89	9.08	Dry	1	614	429	9.08	9.08	68.81	0.00
CHRISTIANA RETAIL CENTER	161.85	15.61	Wet	2	615	388	15.24	15.24	146.61	0.38
CHRISTIANA TOWN CENTER	25.94	161.29	Wet	2	616	267	9.62	9.62	16.32	151.67
CHRISTINA MILL APTS	27.93	1.67	Dry	1	10096	501	1.67	1.67	26.26	0.00
CHRISTINAS BRACE	10.88	4.49	Dry	1	618	244	4.46	4.46	6.41	0.03
CHRYSLER CORPORATION	297.77	9.02	Wet	2	10103	491	9.02	9.02	288.75	0.00
CINNAMON STATION	73.92	13.42	Wet	2	621	275	13.40	13.40	60.52	0.02
CLEAN EARTH OF NEW CASTLE INC	5.14	0.31	Wet	2	626	256	0.31	0.31	4.83	0.00
COBBLEFIELD	12.20	2.91	Dry	1	10015	510	2.11	2.11	10.08	0.80
COOCHES BRIDGE INDUSTRIAL PARK	3.71	3.07	Wet	2	10016	475	2.50	2.50	1.21	0.57
COOPERS RUN	45.21	1.45	Dry	1	636	291	0.74	0.74	44.47	0.71
COOPERS RUN	45.21	22.90	Dry	1	637	291	22.28	22.28	22.93	0.62
CORNELL PARK	28.80	22.32	Dry	1	638	328	13.49	13.49	15.31	8.83
CORNERSTONE MINISTRIES INC	5.52	2.40	Wet	2	639	367	2.39	2.39	3.13	0.01
COUNTRY CREEK	54.79	64.32	Dry	1	58	387	46.59	46.59	8.20	17.73
COUNTRY HILLS	32.98	17.74	Wet	2	10027	467	13.96	13.96	19.01	3.78
COUNTRY PLACE	9.60	18.98	Dry	1	10035	438	0.81	0.81	8.79	18.17
CROSSINGS AT CHRISTIANA	30.63	27.56	Wet	2	1134	374	21.94	21.94	8.69	5.62

Subdiv Name	Subdiv Acres	BMP Acres	Pond Type	Pond Code	BMP ID	Subdiv ID	Intersected Acres	Acres Subdiv Drained By BMP	Acres Subdiv Not Drained by BMP	Acres BMP Outside Subdiv
CROSSVIEW BUSINESS PARK	11.74	3.37	Dry	1	10044	450	1.15	1.15	10.59	2.22
D & D INDUSTRIAL PARK	2.03	0.63	Dry	1	645	231	0.63	0.63	1.41	0.00
DEER PARK PLAZA	6.36	3.37	Wet	2	656	219	3.34	3.34	3.02	0.03
DEERBORNE WOODS	131.89	27.78	Wet	2	657	423	16.84	16.84	115.05	10.93
DEERBORNE WOODS	131.89	26.77	Wet	2	658	423	25.81	25.81	106.08	0.96
DELAWARE INDUSTRIAL PARK	91.72	2.58	Dry	1	661	298	2.58	2.58	89.14	0.00
DELAWARE INDUSTRIAL PARK	91.72	152.60	Dry	1	662	298	10.30	10.30	81.43	142.30
DELAWARE INDUSTRIAL PARK	91.72	1.22	Dry	1	663	298	0.77	0.77	90.95	0.45
DELAWARE INDUSTRIAL PARK	91.72	11.39	Dry	1	664	298	5.03	5.03	86.70	6.36
DELAWARE INDUSTRIAL PARK	91.72	0.40	Wet	2	665	298	0.40	0.40	91.32	0.00
DELAWARE INTERSTATE IND PARK	73.98	0.48	Dry	1	649	404	0.48	0.48	73.51	0.00
DELAWARE INTERSTATE IND PARK	73.98	8.81	Wet	2	650	404	7.94	7.94	66.05	0.87
DELAWARE INTERSTATE IND PARK	73.98	0.77	Dry	1	651	404	0.77	0.77	73.21	0.00
DELAWARE INTERSTATE IND PARK	73.98	0.89	Dry	1	652	404	0.89	0.89	73.09	0.00
DELAWARE INTERSTATE IND PARK	73.98	0.43	Dry	1	653	404	0.43	0.43	73.55	0.00
DELAWARE INTERSTATE IND PARK	73.98	2.10	Dry	1	654	404	2.10	2.10	71.88	0.00
DELAWARE RIVER INDUSTRIAL PARK	46.39	10.14	Dry	1	668	303	10.14	10.14	36.25	0.00
DELAWARE TURNPIKE	2.24	0.37	Dry	1	610	352	0.22	0.22	2.02	0.15
DELAWARE TURNPIKE	20.13	3.43	Wet	2	10045	494	3.43	3.43	16.70	0.00
DELMARVA POWER & LIGHT COMPANY	18.21	0.49	Dry	1	537	310	0.35	0.35	17.86	0.15
DUNSMORE	8.73	0.44	Dry	1	673	343	0.44	0.44	8.29	0.00
E I DUPONT DENEMOURS & COMPANY	47.10	4.54	Wet	2	974	335	4.54	4.54	42.56	0.00
EAGLE TRACE	20.25	11.80	Wet	2	674	235	10.74	10.74	9.51	1.05
ELMWOOD SEC 2	45.88	16.51	Dry	1	33	238	12.55	12.55	33.33	3.95
ELMWOOD SEC 2	45.88	16.51	Dry	1	33	238	0.00	0.00	45.88	16.51
EMBASSY SUITES	8.76	2.85	Wet	2	10020	439	0.60	0.60	8.15	2.25
EVERLASTING PRESBYTERIAN CHURC	2.28	0.21	Dry	1	984	314	0.21	0.21	2.07	0.00
FAIRTHORNE	68.16	30.61	Dry	1	31	418	3.33	3.33	64.84	27.29
FAIRTHORNE	68.16	8.83	Dry	1	680	418	7.54	7.54	60.62	1.29
FERM INDUSTRIAL PARK	28.15	3.97	Wet	2	859	397	3.97	3.97	24.18	0.00
FERYN FARMS	5.01	10.35	Dry	1	683	427	3.86	3.86	1.14	6.49
FOREST GLEN	27.41	18.33	Wet	2	861	369	17.02	17.02	10.39	1.31
FOREST GLEN	47.23	124.79	Dry	1	426	371	13.87	13.87	33.36	110.92
FOREST GLEN	47.23	12.26	Dry	1	427	371	12.26	12.26	34.97	0.00

Table 5.4 (continued)

Subdiv Name	Subdiv Acres	BMP Acres	Pond Type	Pond Code	BMP ID	Subdiv ID	Intersected Acres	Acres Subdiv Drained By BMP	Acres Subdiv Not Drained by BMP	Acres BMP Outside Subdiv
FOREST RIDGE	29.78	13.30	Wet	2	429	286	13.04	13.04	16.74	0.27
FOUR SEASONS PLAZA	18.92	8.64	Wet	2	433	338	8.64	8.64	10.28	0.00
FOUR SEASONS PLAZA	18.92	0.34	Dry	1	434	338	0.34	0.34	18.58	0.00
FOX RUN	155.33	1.37	Dry	1	439	223	1.37	1.37	153.96	0.00
FOX RUN	155.33	35.05	Dry	1	440	223	25.78	25.78	129.55	9.27
FOX RUN	155.33	18.23	Dry	1	441	223	18.18	18.18	137.15	0.05
FOX RUN BUSINESS CENTER	34.97	40.05	Dry	1	442	368	15.84	15.84	19.13	24.22
GATEWAY VILLAGE CORP	1.57	0.06	Dry	1	10052	435	0.06	0.06	1.51	0.00
GATEWAY VILLAGE CORP	1.57	0.74	Dry	1	10054	435	0.45	0.45	1.12	0.29
GATEWAY VILLAGE CORP	1.57	1.55	Dry	1	10055	435	0.10	0.10	1.47	1.45
GENDER WOODS	76.87	18.01	Wet	2	445	271	17.90	17.90	58.96	0.10
GERMAY INDUSTRIAL PARK	14.10	7.04	Dry	1	466	407	5.22	5.22	8.88	1.82
GLASGOW MEDICAL CENTER	12.35	11.82	Dry	1	446	282	1.34	1.34	11.02	10.48
GLASGOW MEDICAL CENTER	12.35	8.77	Dry	1	447	282	8.12	8.12	4.23	0.65
GLASGOW PINES	145.02	5.06	Wet	2	448	288	4.23	4.23	140.79	0.83
GLENDALE PLAZA	19.17	11.50	Wet	2	411	409	2.04	2.04	17.13	9.46
GLENDALE WEST	3.22	0.29	Dry	1	450	285	0.28	0.28	2.94	0.01
GLENNWOOD STATION	9.53	6.37	Dry	1	1021	383	6.05	6.05	3.48	0.32
GOVERNORS SQUARE	80.10	1.54	Dry	1	452	304	1.54	1.54	78.56	0.00
GOVERNORS SQUARE	80.10	0.59	Dry	1	867	304	0.59	0.59	79.51	0.00
GRAY ACRES	138.27	33.62	Wet	2	456	254	33.60	33.60	104.67	0.03
GRAY ACRES	138.27	13.85	Dry	1	457	254	13.85	13.85	124.42	0.00
GRAYSTONE PLAZA	5.58	10.60	Dry	1	458	230	0.96	0.96	4.62	9.64
GREENVILLE PLACE	55.41	0.86	Dry	1	866	295	0.86	0.86	54.55	0.00
HAWKS NEST	13.95	18.94	Dry	1	463	416	9.66	9.66	4.29	9.28
HEAD INJURY RECOVERY FACILITY	21.36	14.62	Wet	2	385	260	9.16	9.16	12.21	5.46
HERITAGE PRESBYTERIAN CHURCH	2.96	0.67	Dry	1	1146	316	0.67	0.67	2.29	0.00
HOLY FAMILY PARISH	14.76	2.97	Wet	2	1001	342	2.97	2.97	11.79	0.00
HOWARD RICHARD	11.54	0.08	Wet	2	402	232	0.08	0.08	11.46	0.00
HOWARD RICHARD	11.54	0.15	Wet	2	923	232	0.15	0.15	11.39	0.00
INTERCHANGE BUSINESS PARK	20.53	16.51	Dry	1	10061	477	2.14	2.14	18.39	14.37
INTERCHANGE BUSINESS PARK	20.53	0.71	Dry	1	10063	477	0.71	0.71	19.82	0.00
INTERCHANGE BUSINESS PARK	20.53	31.59	Dry	1	10064	477	12.29	12.29	8.24	19.30
INTERSTATE BUSINESS PARK L P	34.42	996.46	Dry	1	10060	507	8.70	8.70	25.72	987.76

Table 5.4 (continued)

Table 5.4 (continued)

Subdiv Name	Subdiv Acres	BMP Acres	Pond Type	Pond Code	BMP ID	Subdiv ID	Intersected Acres	Acres Subdiv Drained By BMP	Acres Subdiv Not Drained by BMP	Acres BMP Outside Subdiv
IRON HILL APARTMENTS	33.39	13.70	Wet	2	149	287	13.58	13.58	19.81	0.12
ISLAMIC SOCIETY OF DELAWARE	3.75	0.25	Wet	2	406	263	0.25	0.25	3.51	0.00
J & M COMMERCIAL PARK	6.49	0.59	Dry	1	797	390	0.56	0.56	5.93	0.03
J P MORGAN	154.94	3.37	Wet	2	423	395	2.47	2.47	152.48	0.91
KEENER LANDSCAPING	3.62	0.98	Dry	1	999	414	0.97	0.97	2.64	0.01
KENSINGTON	37.33	14.94	Dry	1	410	356	14.78	14.78	22.55	0.15
L A ASSOCIATES	7.39	1.27	Wet	2	185	430	0.30	0.30	7.09	0.97
LANCASTER PIKE MARKET	5.21	3.12	Dry	1	1147	290	2.63	2.63	2.58	0.50
LEWIS COMMERCIAL CENTER	11.09	1.20	Wet	2	344	349	0.80	0.80	10.30	0.41
LEWIS GRACE L	7.54	5.95	Dry	1	667	300	3.38	3.38	4.16	2.57
LITTLE FALLS CENTRE	148.66	11.22	Dry	1	472	274	11.22	11.22	137.44	0.00
LITTLE FALLS CENTRE	148.66	2.28	Dry	1	473	274	2.28	2.28	146.38	0.00
LITTLE FALLS CENTRE	148.66	0.94	Dry	1	474	274	0.94	0.94	147.72	0.00
LITTLE FALLS CENTRE	148.66	20.98	Dry	1	475	274	20.98	20.98	127.68	0.00
LITTLE FALLS CENTRE	148.66	6.25	Dry	1	1055	274	6.12	6.12	142.54	0.13
M & M FLOORING INC	1.11	1.50	Dry	1	362	425	0.48	0.48	0.63	1.02
MANN/ARO/PIE TRACT	95.67	176.03	Dry	1	10073	455	71.18	71.18	24.49	104.85
MANSION FARM PHASE 3	383.82	28.48	Wet	2	376	249	25.93	25.93	357.89	2.54
MANSION FARM PHASE 3	383.82	4.82	Wet	2	377	249	4.82	4.82	379.00	0.00
MANSION FARM PHASE 3	383.82	25.76	Wet	2	378	249	25.76	25.76	358.07	0.00
MANSION PARK	5.69	3.26	Dry	1	2	331	3.19	3.19	2.50	0.06
MARTIAL ARTS CENTER	1.34	10.58	Dry	1	960	311	0.87	0.87	0.47	9.71
MARYDALE	21.04	22.40	Dry	1	291	344	14.30	14.30	6.75	8.11
MASONIC HOME OF DELAWARE INC	10.40	1.58	Dry	1	292	255	1.27	1.27	9.13	0.31
MBNA AMERICA AT CHRISTIANA CENTER	238.29	21.42	Dry	1	363	302	19.47	19.47	218.82	1.95
MBNA AMERICA AT CHRISTIANA CENTER	238.29	1.95	Wet	2	368	302	1.95	1.95	236.35	0.00
MEDORI INDUSTRIAL PARK	11.74	2.33	Dry	1	298	337	2.33	2.33	9.41	0.00
MEGHANS COURT	3.14	3.92	Dry	1	299	357	2.13	2.13	1.01	1.79
MILLSTONE PLAZA	2.91	1.77	Wet	2	10108	502	1.71	1.71	1.19	0.06
MODERN CONTROLS INC	0.87	4.33	Wet	2	315	252	0.40	0.40	0.47	3.93
NEW CASTLE COUNTY AIRPORT	0.92	18.27	Wet	2	55	361	0.34	0.34	0.59	17.93
NEWARK	11.75	1.08	Dry	1	10097	449	0.55	0.55	11.21	0.53
NEWARK	76.74	4.10	Dry	1	10099	469	4.10	4.10	72.64	0.00
NEWARK CHARTER SCHOOL	40.10	2.89	Wet	2	10048	431	2.89	2.89	37.21	0.00

Subdiv Name	Subdiv Acres	BMP Acres	Pond Type	Pond Code	BMP ID	Subdiv ID	Intersected Acres	Acres Subdiv Drained By BMP	Acres Subdiv Not Drained by BMP	Acres BMP Outside Subdiv
NEWARK CHARTER SCHOOL	40.10	2.69	Dry	1	10065	431	2.69	2.69	37.40	0.00
NEWARK COMMUTER RAIL STATION	5.50	2.08	Wet	2	10104	452	1.68	1.68	3.82	0.40
NEWARK INDUSTRIAL PARK	1.06	0.23	Dry	1	1078	297	0.15	0.15	0.91	0.08
NEWARK INTERSTATE BUSINESS PARK	46.89	6.87	Wet	2	10101	463	6.86	6.86	40.03	0.01
NEWARK RAMADA	2.29	3.56	Wet	2	10079	505	1.63	1.63	0.66	1.92
NEWTOWN VILLAGE SEC III	30.43	13.01	Wet	2	321	273	9.24	9.24	21.18	3.77
NEWTOWN VILLAGE SEC III	30.43	6.11	Dry	1	322	273	5.66	5.66	24.77	0.45
NICHOLS NURSERY/WAWA PERCH CREEK	7.80	3.88	Dry	1	323	426	3.43	3.43	4.38	0.45
NORWEGIAN WOODS PH I SEC II	177.17	16.95	Wet	2	327	312	16.95	16.95	160.23	0.00
NORWEGIAN WOODS PH I SEC II	177.17	9.49	Wet	2	328	312	9.49	9.49	167.68	0.00
NORWEGIAN WOODS PH I SEC II	177.17	15.01	Wet	2	329	312	14.80	14.80	162.38	0.22
NORWEGIAN WOODS PH I SEC II	177.17	23.08	Wet	2	330	312	23.08	23.08	154.09	0.00
NORWEGIAN WOODS PH I SEC II	177.17	12.18	Wet	2	331	312	11.49	11.49	165.69	0.69
NORWEGIAN WOODS PH I SEC II	177.17	4.51	Wet	2	632	312	1.32	1.32	175.85	3.18
OLD PIKE SHOPS	2.83	1.62	Dry	1	246	417	0.98	0.98	1.86	0.65
OLD POST FARM	70.80	24.78	Wet	2	64	281	15.47	15.47	55.33	9.31
PARKWAY SQUARE	3.15	0.11	Dry	1	255	221	0.11	0.11	3.03	0.00
PAULINE A MAYER INC	76.45	118.57	Dry	1	10086	465	15.29	15.29	61.16	103.28
PENCADER CORPORATE CENTER	369.73	15.31	Wet	2	256	266	15.31	15.31	354.43	0.00
PENCADER CORPORATE CENTER	369.73	2.70	Wet	2	257	266	2.70	2.70	367.03	0.00
PENCADER CORPORATE CENTER	369.73	15.76	Dry	1	870	266	15.76	15.76	353.97	0.00
PENCADER CORPORATE CENTER	369.73	16.15	Dry	1	1178	266	16.15	16.15	353.58	0.00
PENCADER VILLAGE	38.85	20.38	Dry	1	41	268	17.27	17.27	21.58	3.11
PEOPLES PLAZA	74.86	304.18	Wet	2	258	239	69.80	69.80	5.06	234.38
PERCH CREEK III	76.93	23.59	Wet	2	262	365	23.58	23.58	53.35	0.01
PERCH CREEK/KOHLS	48.16	13.20	Wet	2	259	366	12.02	12.02	36.13	1.17
PERCH CREEK/KOHLS	48.16	23.61	Wet	2	260	366	16.93	16.93	31.23	6.68
PLAZA FOUR	11.20	3.34	Wet	2	277	242	3.20	3.20	8.00	0.14
PRESERVE AT LAFAYETTE HILL	81.25	42.12	Wet	2	196	362	40.76	40.76	40.49	1.36
PRESTWICK	19.32	11.36	Dry	1	273	332	11.36	11.36	7.97	0.00
PRODUCE MARKETING	4.28	4.40	Dry	1	10068	508	2.39	2.39	1.89	2.01
PRODUCE MARKETING	4.28	46.04	Dry	1	10076	508	0.92	0.92	3.36	45.12
PROVIDENT MUTUAL LIFE INSURANC	22.25	5.63	Wet	2	275	320	5.61	5.61	16.64	0.03
RESERVE AT IRONSIDE	57.55	63.90	Wet	2	197	261	5.16	5.16	52.39	58.73

Table 5.4 (continued)

Table 5.4 (continued)

Subdiv Name	Subdiv Acres	BMP Acres	Pond Type	Pond Code	BMP ID	Subdiv ID	Intersected Acres	Acres Subdiv Drained By BMP	Acres Subdiv Not Drained by BMP	Acres BMP Outside Subdiv
RESIDENCE INN	6.46	15.74	Wet	2	282	277	2.27	2.27	4.19	13.47
RICKEY COMMERCE CENTER	1.34	4.92	Dry	1	1025	372	0.11	0.11	1.22	4.81
RICKEY COMMERCE CENTER	31.62	4.30	Wet	2	428	370	1.51	1.51	30.11	2.79
RITE AID PHARMACY	2.83	3.32	Dry	1	286	289	1.74	1.74	1.09	1.58
RIVER WALK	60.56	33.50	Wet	2	617	382	17.73	17.73	42.83	15.77
RIVERS END	214.58	194.66	Dry	1	48	377	95.87	95.87	118.70	98.79
ROSETREE HUNT	80.63	1.36	Dry	1	206	272	1.36	1.36	79.28	0.00
ROUTE 40 COMMERCIAL SITE	3.11	2.46	Dry	1	208	321	1.08	1.08	2.03	1.39
ROUTE 40/72 COMMERCIAL SITE	3.67	4.29	Dry	1	209	341	1.37	1.37	2.30	2.92
SADDLEBROOK	14.37	15.74	Wet	2	91	381	1.69	1.69	12.68	14.06
SALEM RIDGE	8.40	7.17	Dry	1	219	391	3.79	3.79	4.61	3.39
SALEM WOODS PHASE 2	313.81	169.03	Dry	1	50	428	122.16	122.16	191.64	46.87
SANDT BRAE TOWNHOUSES	12.23	5.81	Wet	2	220	330	5.81	5.81	6.42	0.00
SCHOOL BELL APARTMENTS	32.07	3.60	Wet	2	224	313	3.60	3.60	28.48	0.00
SOUTHRIDGE CONDOMINIUMS	25.70	9.96	Wet	2	10080	480	4.57	4.57	21.12	5.39
SPRINGSIDE PLAZA	43.03	3.43	Dry	1	239	306	3.21	3.21	39.82	0.22
ST ANDREWS	178.90	27.09	Wet	2	240	400	27.08	27.08	151.82	0.01
ST ANDREWS	178.90	31.03	Wet	2	241	400	31.03	31.03	147.87	0.00
ST ANDREWS	178.90	20.89	Wet	2	242	400	17.30	17.30	161.59	3.59
ST ELIZABETH ANN SETON R C CHURCH INC	20.32	0.62	Wet	2	156	248	0.62	0.62	19.69	0.00
ST ELIZABETH ANN SETON R C CHURCH INC	20.32	2.42	Dry	1	157	248	1.92	1.92	18.40	0.50
STONE MILL	32.29	107.93	Wet	2	162	246	28.74	28.74	3.54	79.19
STONE SPRING	17.11	0.58	Dry	1	10084	499	0.58	0.58	16.53	0.00
STONE SPRING	17.11	6.54	Wet	2	10085	499	3.82	3.82	13.28	2.71
SUBURBAN PLAZA - PARCEL B	39.15	37.20	Wet	2	10118	500	1.80	1.80	37.35	35.39
SUMMIT VIEW SEC 1-5	53.13	4.59	Dry	1	177	412	4.59	4.59	48.55	0.00
SUNRISE COURT	6.39	2.76	Dry	1	179	326	2.70	2.70	3.69	0.06
SUNSET STATION	13.11	0.82	Wet	2	449	403	0.82	0.82	12.28	0.00
TALL PINES III	30.59	4.88	Dry	1	186	226	4.86	4.86	25.73	0.02
TATNALL SCHOOL INC	101.18	21.14	Wet	2	191	236	20.98	20.98	80.20	0.16
TAYLORTOWNE	208.88	5.54	Dry	1	143	379	5.54	5.54	203.34	0.00
TERRACES ON IRON HILL	22.06	34.07	Dry	1	192	293	15.67	15.67	6.39	18.40
THE OAKS	9.58	3.62	Dry	1	194	325	3.62	3.62	5.96	0.00
THE OAKS	9.58	77.60	Dry	1	893	325	1.87	1.87	7.71	75.73

Table 5.4 (continued)

Subdiv Name	Subdiv Acres	BMP Acres	Pond Type	Pond Code	BMP ID	Subdiv ID	Intersected Acres	Acres Subdiv Drained By BMP	Acres Subdiv Not Drained by BMP	Acres BMP Outside Subdiv
TIMBER FARMS PHASE III	143.59	2.78	Dry	1	121	323	2.78	2.78	140.81	0.00
TIMBER FARMS PHASE III	143.59	19.64	Wet	2	122	323	18.27	18.27	125.32	1.37
TREELANE TERRACE PHASE 2	25.30	10.58	Dry	1	123	375	10.27	10.27	15.02	0.31
UNITED ELECTRIC SUPPLY CO INC	6.12	0.17	Dry	1	522	394	0.17	0.17	5.95	0.00
UNIVERSITY GARDEN ASSOCIATES	53.30	26.77	Dry	1	1145	329	1.50	1.50	51.80	25.27
UNIVERSITY GARDENS A	4.96	130.48	Wet	2	10046	453	2.06	2.06	2.90	128.42
UNIVERSITY OF DEL	377.98	0.37	Wet	2	10028	459	0.37	0.37	377.62	0.00
UNIVERSITY OF DEL	377.98	14.60	Dry	1	10034	459	14.60	14.60	363.39	0.00
UNIVERSITY OF DEL	377.98	23.27	Wet	2	10089	459	23.27	23.27	354.71	0.00
UNIVERSITY OF DEL	377.98	13.89	Wet	2	10090	459	13.74	13.74	364.24	0.14
VALLEY STREAM	9.41	1.13	Dry	1	10094	506	1.12	1.12	8.29	0.01
VALLEY STREAM VILLAGE	64.11	11.30	Dry	1	130	384	9.33	9.33	54.78	1.96
VALLEY STREAM VILLAGE	64.11	11.54	Dry	1	131	384	6.02	6.02	58.10	5.53
VALLEY STREAM VILLAGE	64.11	0.22	Dry	1	132	384	0.22	0.22	63.90	0.00
VILLAGE OF BECKS POND	48.69	9.98	Dry	1	137	424	9.69	9.69	39.00	0.29
VILLAGE OF BECKS POND	48.69	0.19	Dry	1	397	424	0.19	0.19	48.50	0.00
VILLAGE OF TAHOE	5.76	5.76	Dry	1	142	250	4.11	4.11	1.65	1.66
VILLAGE OF TWIN LAKES	22.58	4.74	Wet	2	10100	441	1.02	1.02	21.57	3.72
WATERFORD MOBILE HOME PARK	165.52	209.63	Wet	2	153	251	156.14	156.14	9.37	53.49
WATERS EDGE CONDOMINIUM	16.92	5.80	Wet	2	65	262	5.80	5.80	11.13	0.00
WAWA	3.73	3.51	Wet	2	68	319	2.11	2.11	1.62	1.41
WAWA AIRPORT ROAD	33.85	0.89	Wet	2	66	229	0.89	0.89	32.95	0.00
WAWA, INC	6.77	2.19	Wet	2	67	398	2.19	2.19	4.58	0.00
WELLINGTON WOODS SEC 1	202.72	120.51	Dry	1	7	386	57.71	57.71	145.01	62.80
WELLINGTON WOODS SEC 1	202.72	55.52	Dry	1	51	386	43.81	43.81	158.91	11.71
WELLINGTON WOODS SEC 1	202.72	34.93	Dry	1	52	386	34.26	34.26	168.46	0.67
WESTOVER HILLS	217.04	4.46	Wet	2	74	345	4.46	4.46	212.58	0.00
WESTOVER WOODS SEC 1	66.47	61.04	Wet	2	5	422	36.85	36.85	29.62	24.19
WESTOVER WOODS SEC 1	66.47	8.22	Dry	1	6	422	8.22	8.22	58.25	0.00
WILMINGTON COLLEGE	19.20	2.12	Dry	1	81	292	1.36	1.36	17.84	0.76
WINSOME COMMONS	5.67	1.88	Dry	1	89	334	1.87	1.87	3.79	0.01
WOODBURNE	12.40	15.74	Wet	2	91	381	9.61	9.61	2.79	6.13
WOODCREST ESTATES	5.93	4.93	Dry	1	3	240	3.35	3.35	2.58	1.58
WOODLAND RUN	49.30	27.59	Wet	2	603	348	11.74	11.74	37.56	15.85

Table 5.4 (continued)

Subdiv Name	Subdiv Acres	BMP Acres	Pond Type	Pond Code	BMP ID	Subdiv ID	Intersected Acres	Acres Subdiv Drained By BMP	Acres Subdiv Not Drained by BMP	Acres BMP Outside Subdiv
WOODLAND VILLAGE	95.27	20.70	Wet	2	93	225	20.70	20.70	74.57	0.00
WOODLAND VILLAGE	95.27	9.28	Wet	2	94	225	9.28	9.28	85.98	0.00
WOODLAND VILLAGE	95.27	13.75	Wet	2	95	225	10.25	10.25	85.01	3.50
WOODSHADE SOUTH PHASE 1	37.27	30.91	Dry	1	605	322	22.27	22.27	15.00	8.64
WORTHY BROTHERS CORP PAR 1-B	2.86	0.53	Dry	1	576	351	0.53	0.53	2.33	0.00
YORKSHIRE WOODS SEC II	29.84	6.01	Wet	2	10040	488	5.98	5.98	23.86	0.03
	12.98	0.34	Dry	1	249	283	0.34	0.34	12.64	0.00
	23.38	0.56	Dry	1	860	402	0.54	0.54	22.83	0.02
	1732.79	3.57	Dry	1	600	376	3.57	3.57	1732.79	0.00

VI. Figures

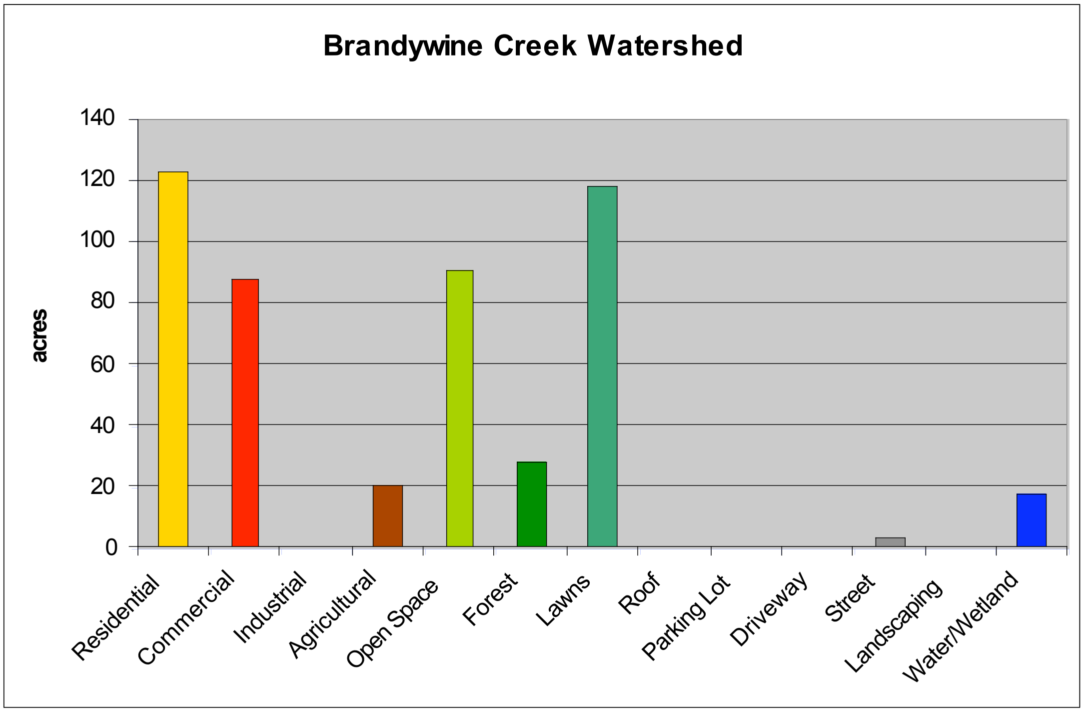

Figure 6.1 Land use acreages for stormwater-pond catchments in the Brandywine Creek watershed.

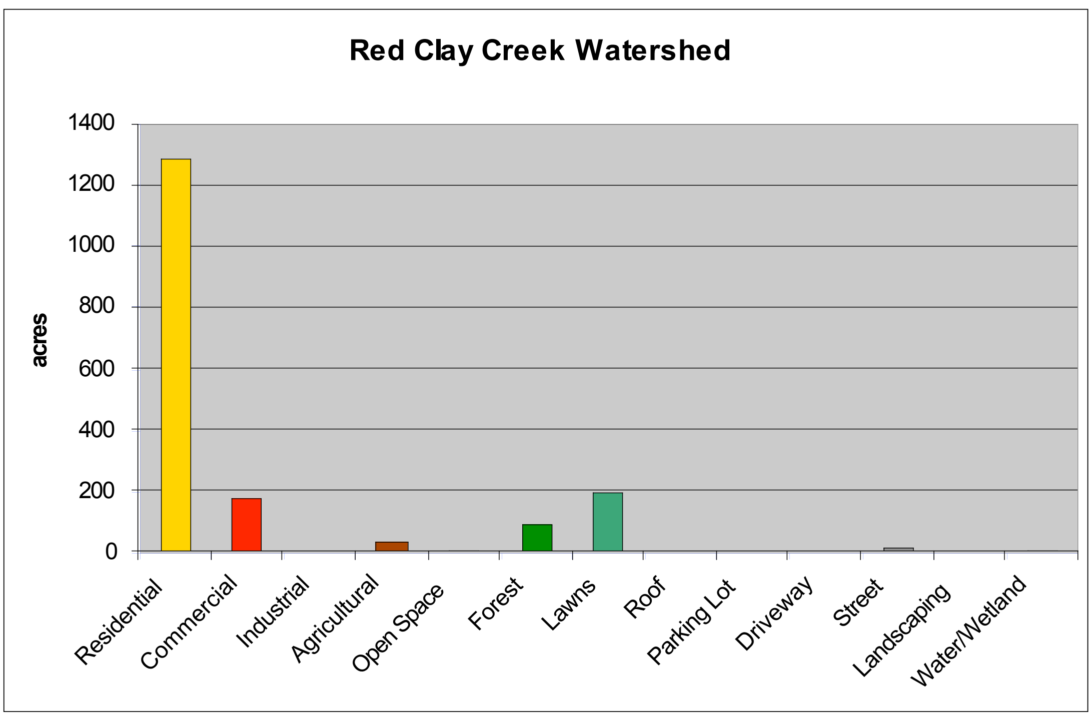

Figure 6.2 Land use acreages for stormwater-pond catchments in the Red Clay Creek watershed.

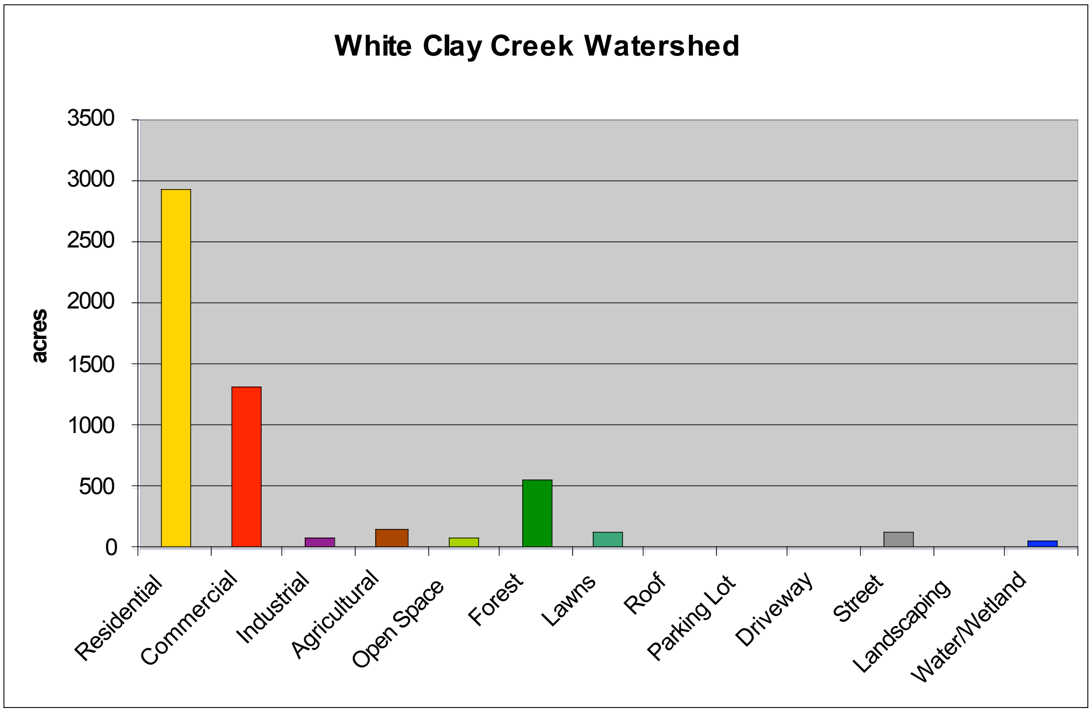

Figure 6.3 Land use acreages for stormwater-pond catchments in the White Clay Creek watershed.

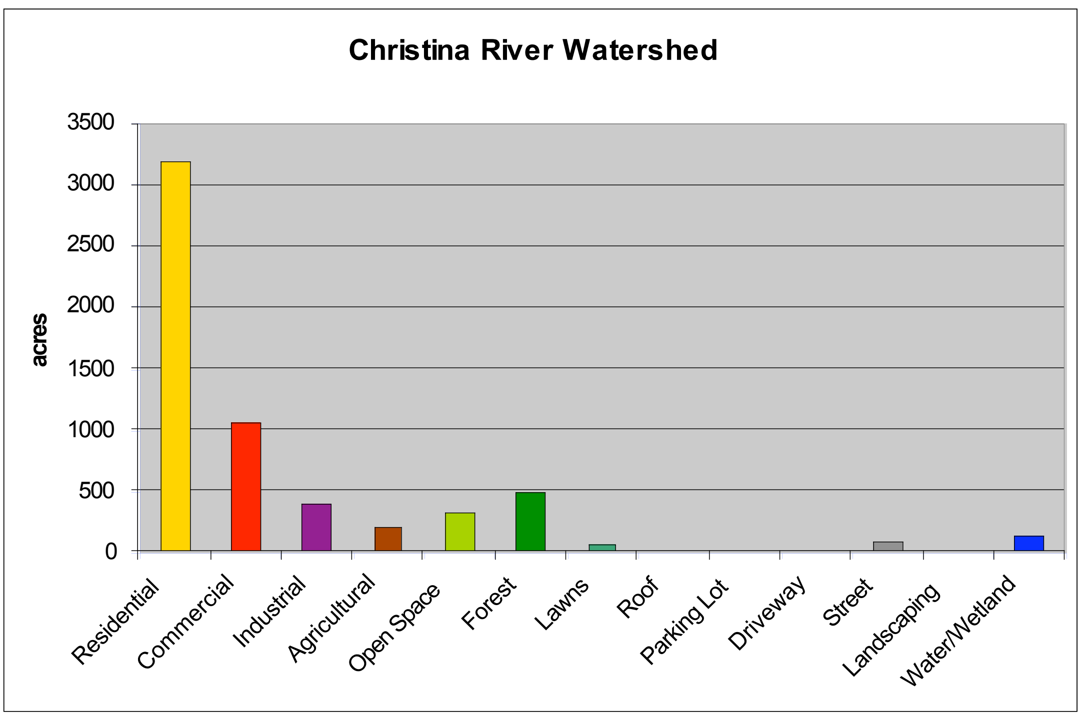

Figure 6.4 Land use acreages for stormwater pond catchments in the Christina River watershed.

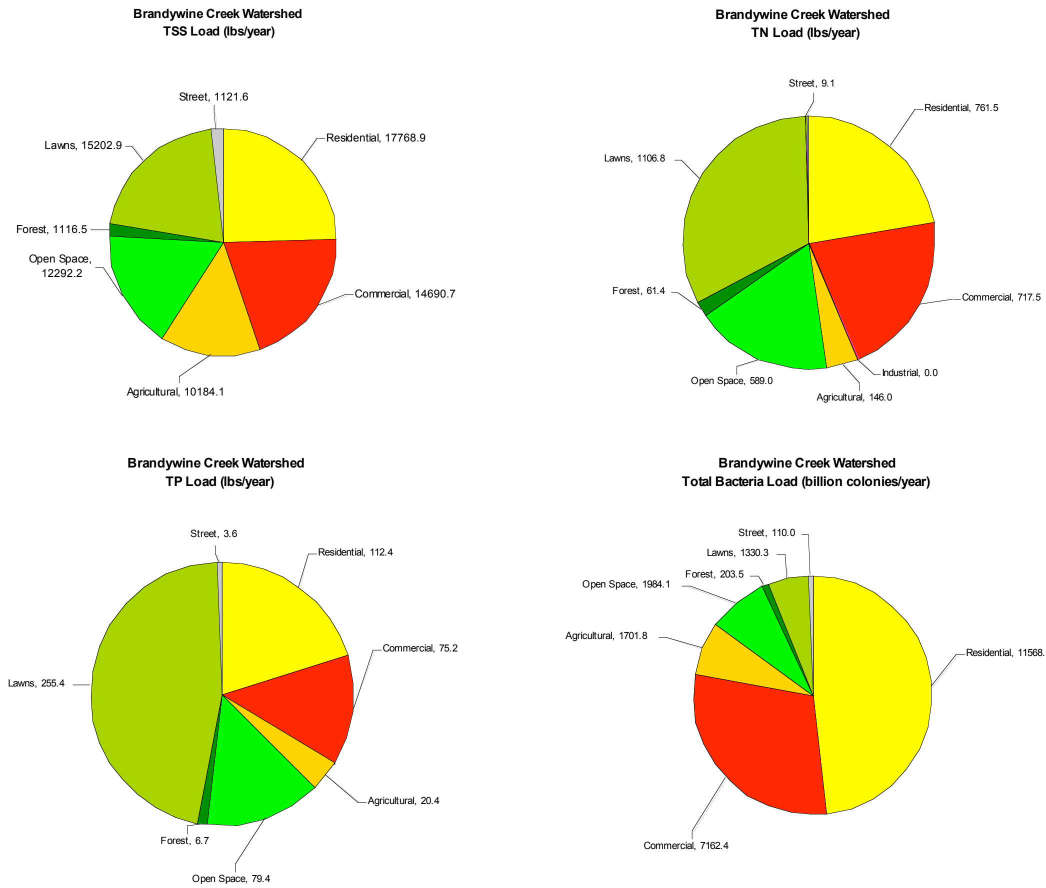

Figure 6.5 Pollutant loads for various land use types for ponds in the Brandywine Creek watershed. Values represent loads in pond catchments only, not in the entire watershed. Units are in pounds per year, except bacteria, which is expressed in billions of colonies per year.

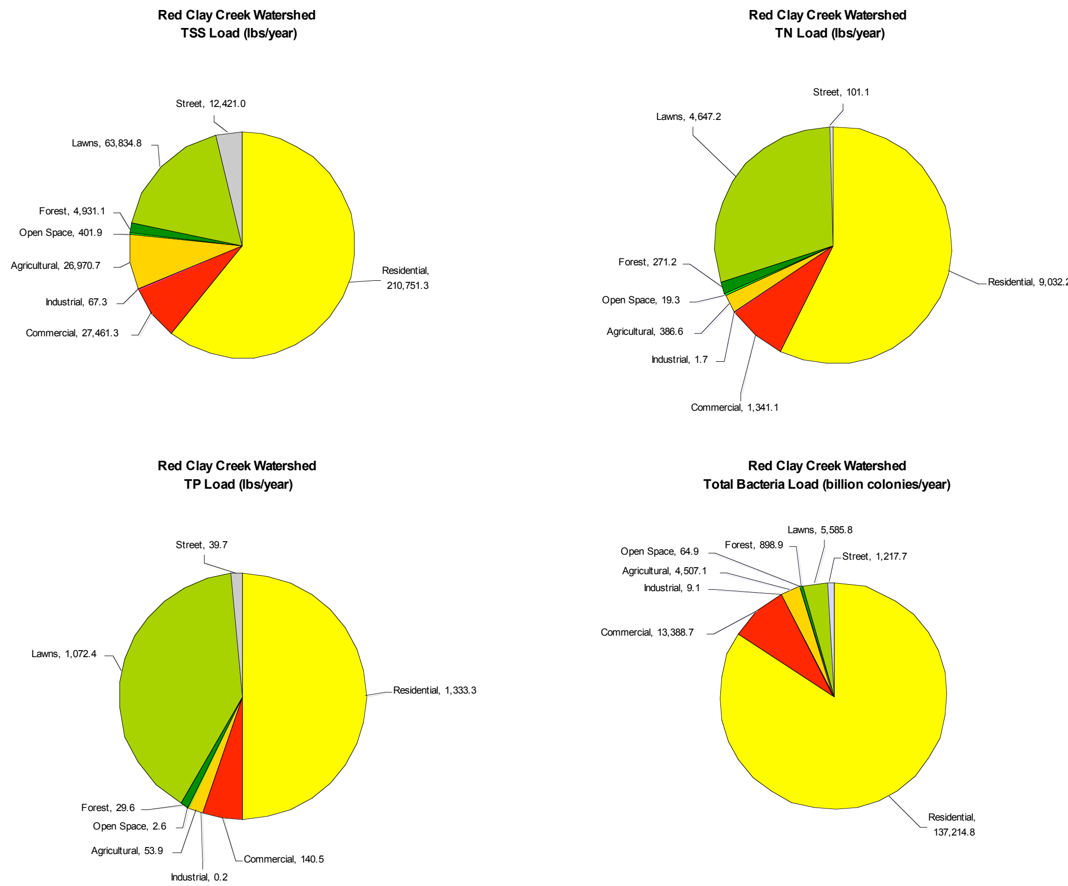

Figure 6.6 Pollutant loads for various land use types for ponds in the Red Clay Creek watershed. Values represent loads in pond catchments only, not in the entire watershed. Units are in pounds per year, except bacteria, which is expressed in billions of colonies per year.

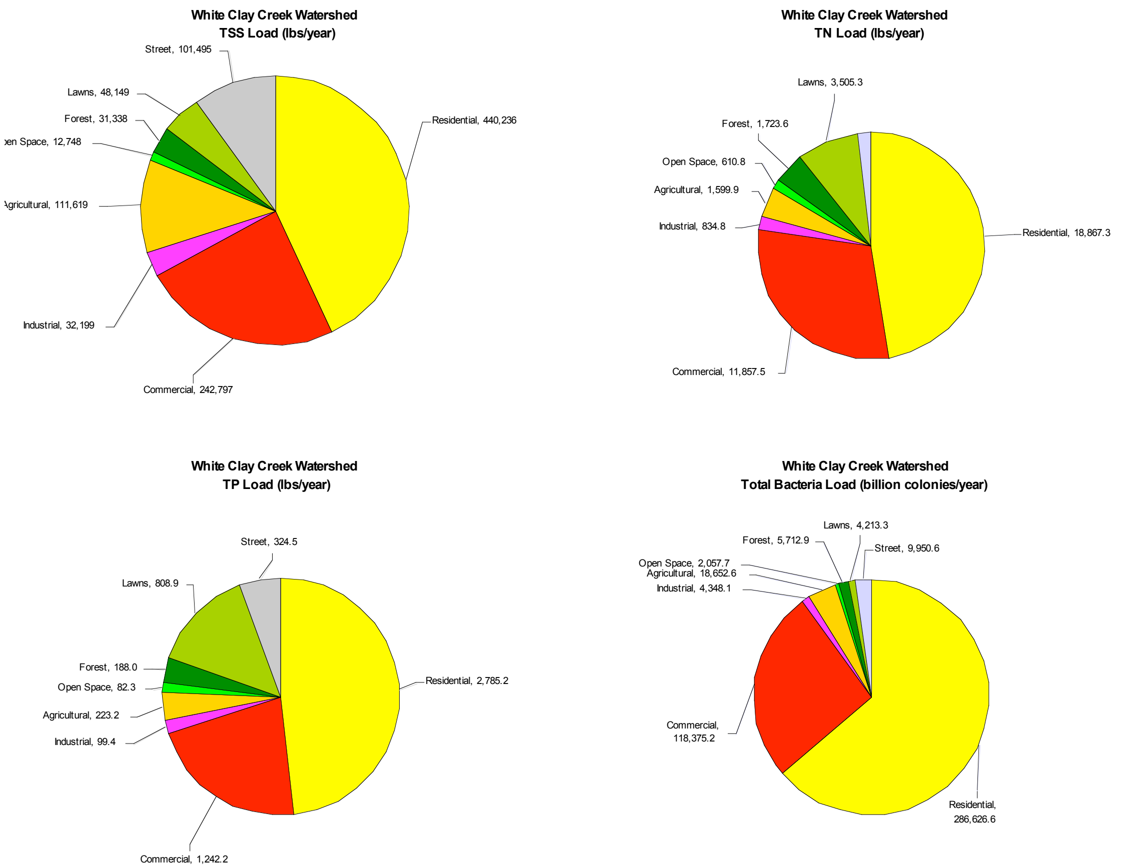

Figure 6.7 Pollutant loads for various land use types for ponds in the White Clay Creek watershed. Values represent loads in pond catchments only, not in the entire watershed. Units are in pounds per year, except bacteria, which is expressed in billions of colonies per year.

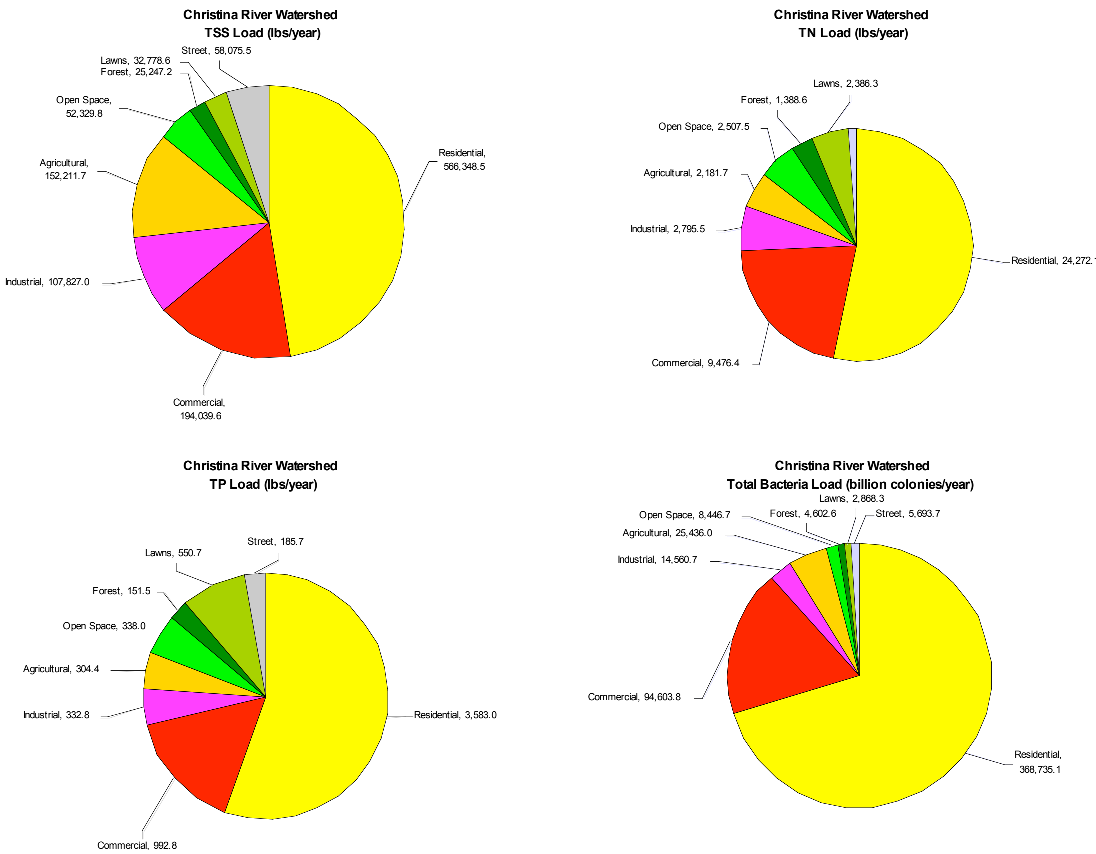

Figure 6.8 Pollutant loads for various land use types for ponds in the Christina River watershed. Values represent loads in pond catchments only, not in the entire watershed. Units are in pounds per year, except bacteria, which is expressed in billions of colonies per year.

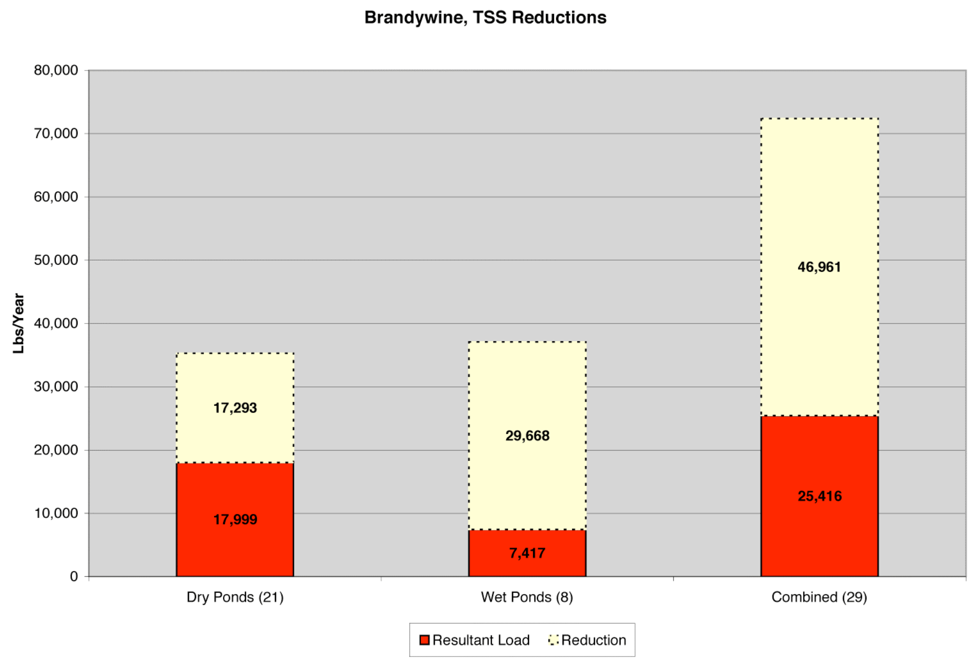

Figure 6.9 Reductions in total suspended sediment from stormwater ponds in the Brandywine Creek watershed, shown by yellow bar. The resultant load after treatment is represented by the red bar. Total load is shown by the full height of each bar. Total ponds=29 (21 dry ponds, 8 wet ponds).

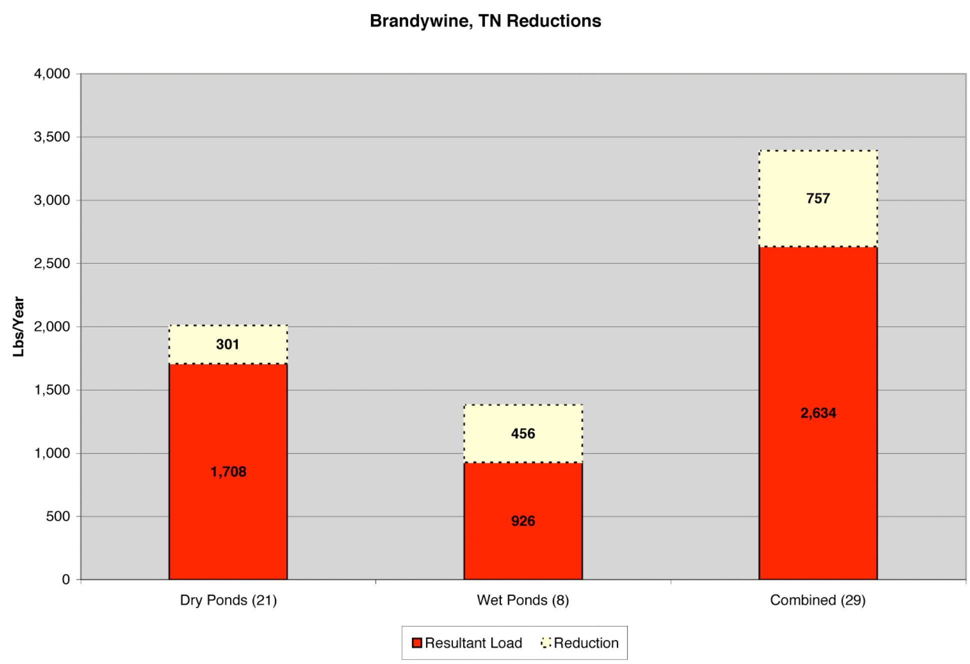

Figure 6.10 Reductions in total nitrogen from stormwater ponds in the Brandywine Creek watershed, shown by yellow bar. The resultant load after treatment is represented by the red bar. Total load is shown by the full height of each bar. Total ponds=29 (21 dry ponds, 8 wet ponds).

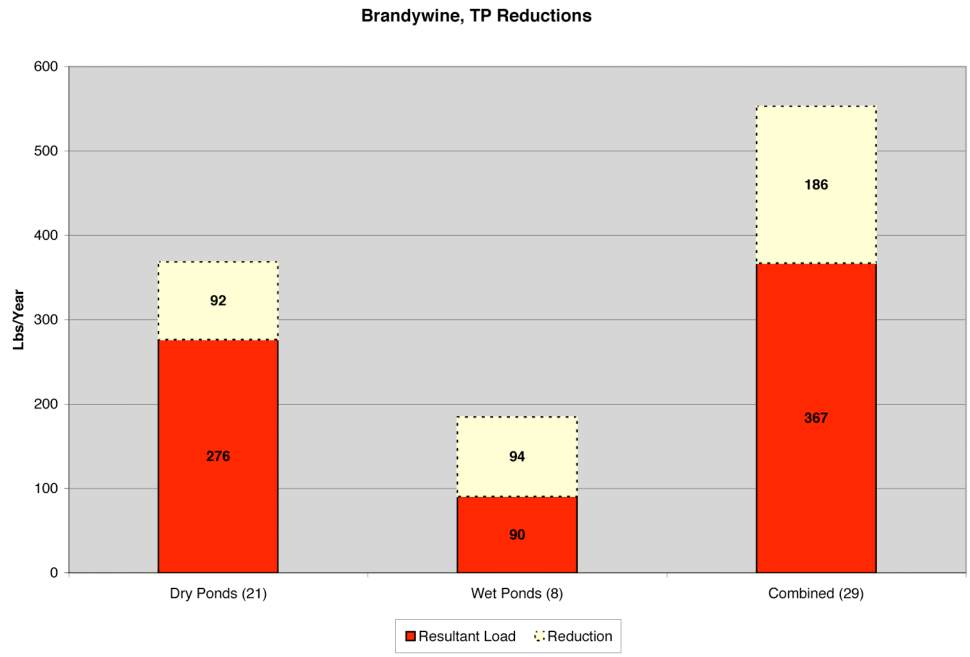

Figure 6.11 Reductions in total phosphorous from stormwater ponds in the Brandywine Creek watershed, shown by yellow bar. The resultant load after treatment is represented by the red bar. Total load is shown by the full height of each bar. Total ponds=29 (21 dry ponds, 8 wet ponds).

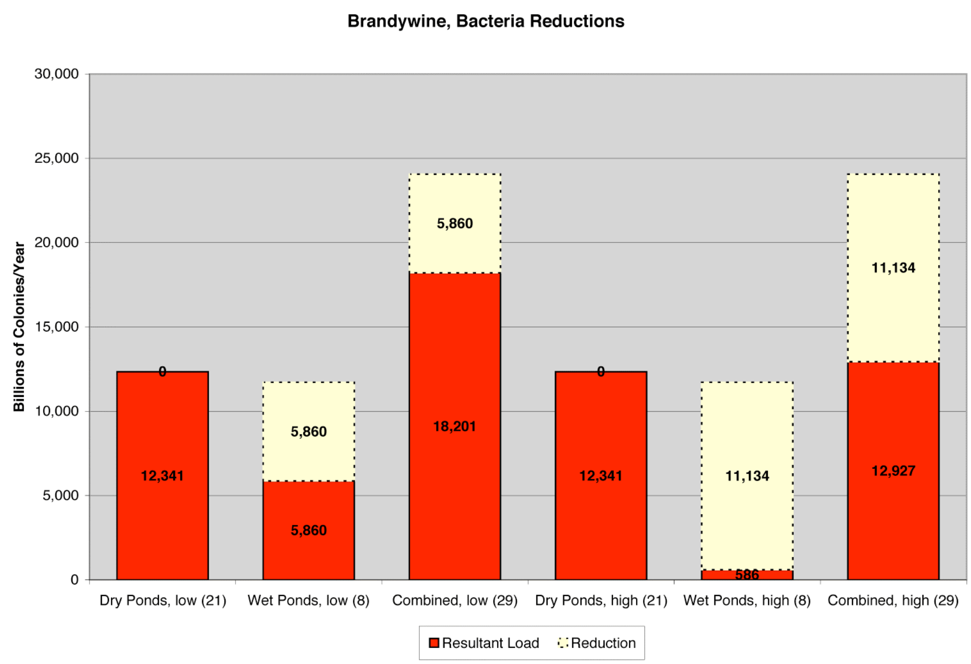

Figure 6.12 Reductions in bacteria (high and low ranges of removal efficiencies) from stormwater ponds in the Brandywine Creek watershed, shown by yellow bar. The resultant load after treatment is represented by the red bar. Total load is shown by the full height of each bar. Total ponds=29 (21 dry ponds, 8 wet ponds).

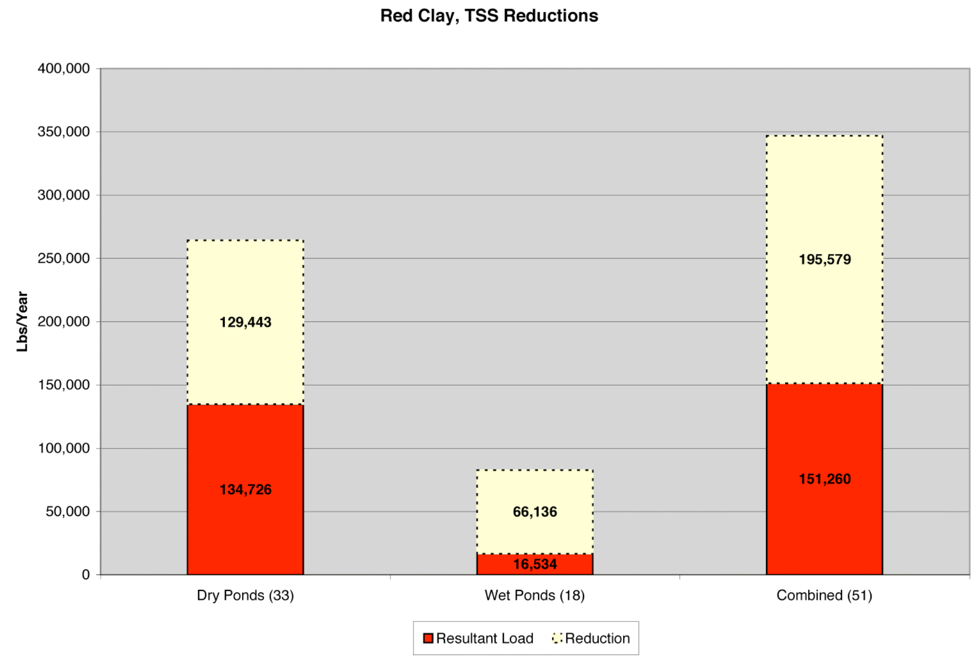

Figure 6.13 Reductions in total suspended sediment from stormwater ponds in the Red Clay Creek watershed, shown by yellow bar. The resultant load after treatment is represented by the red bar. Total load is shown by the full height of each bar. Total ponds=51 (33 dry ponds, 18 wet ponds).

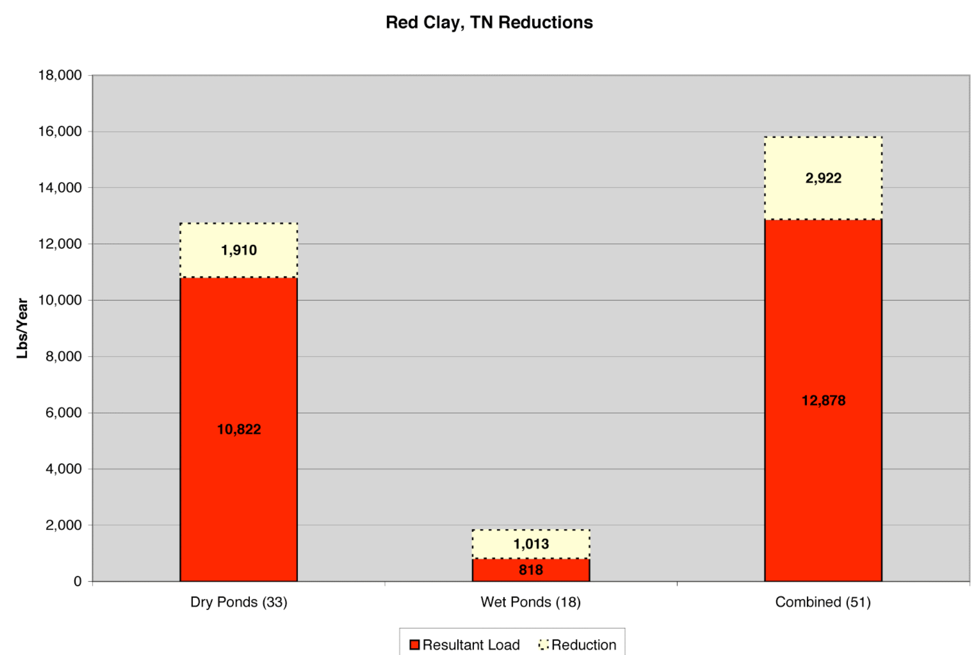

Figure 6.14 Reductions in total nitrogen from stormwater ponds in the Red Clay Creek watershed, shown by yellow bar. The resultant load after treatment is represented by the red bar. Total load is shown by the full height of each bar. Total ponds=51 (33 dry ponds, 18 wet ponds).

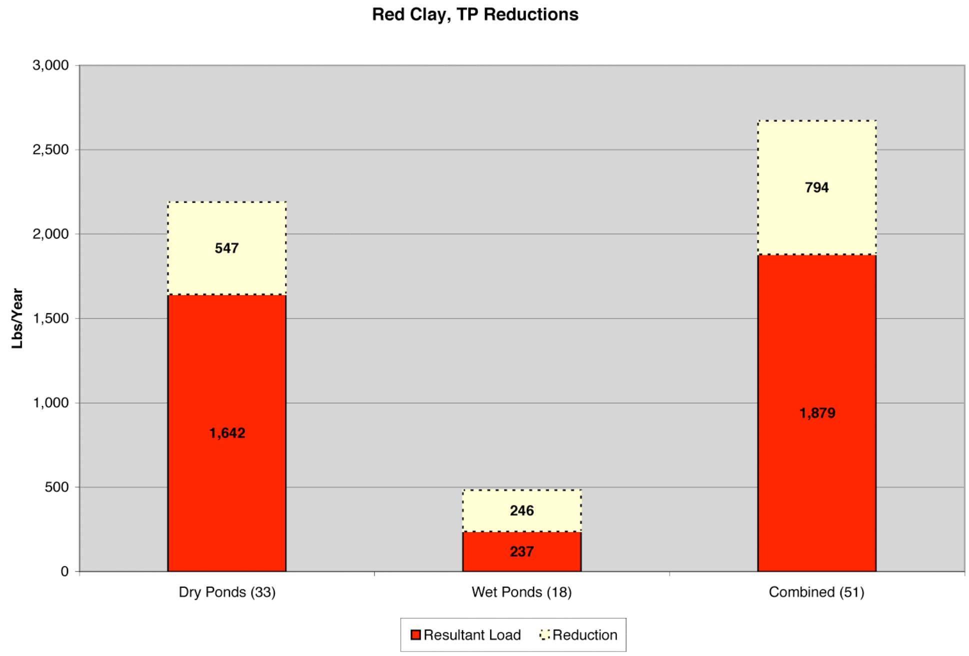

Figure 6.15 Reductions in total phosphorous from stormwater ponds in the Red Clay Creek watershed, shown by yellow bar. The resultant load after treatment is represented by the red bar. Total load is shown by the full height of each bar. Total ponds=51 (33 dry ponds, 18 wet ponds).

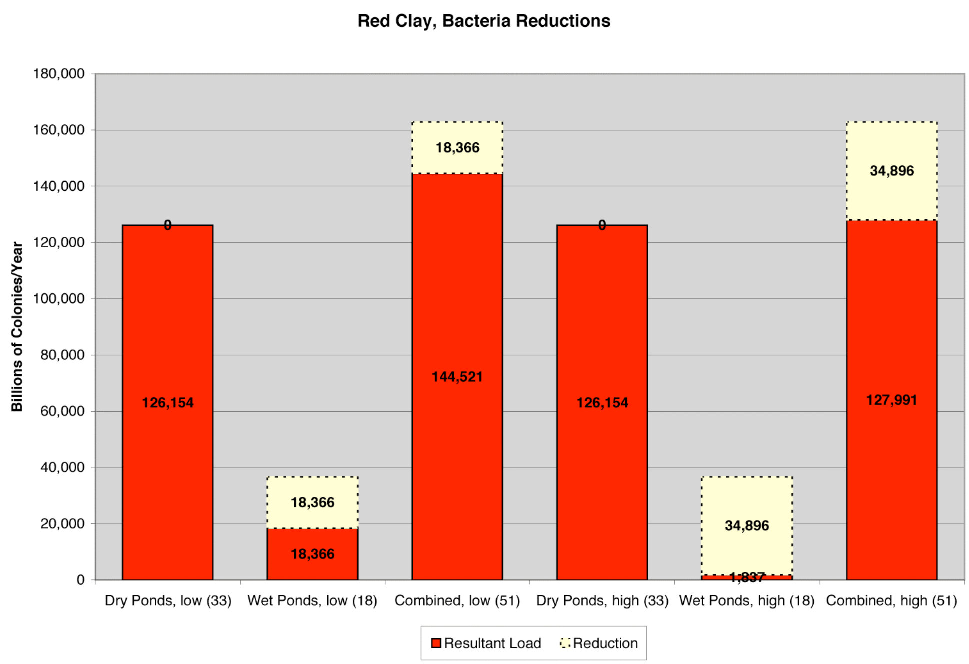

Figure 6.16 Reductions in bacteria (high and low ranges of removal efficiencies) from stormwater ponds in the Red Clay Creek watershed, shown by yellow bar. The resultant load after treatment is represented by the red bar. Total load is shown by the full height of each bar. Total ponds=51 (33 dry ponds, 18 wet ponds).

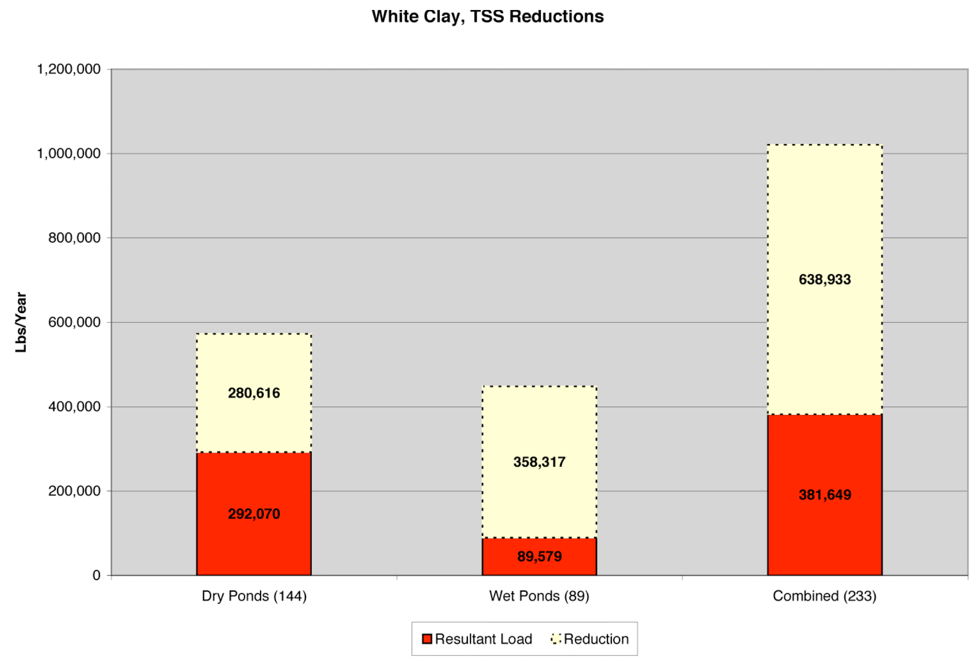

Figure 6.17 Reductions in total suspended sediment from stormwater ponds in the White Clay Creek watershed, shown by yellow bar. The resultant load after treatment is represented by the red bar. Total load is shown by the full height of each bar. Total ponds=233 (144 dry ponds, 89 wet ponds).

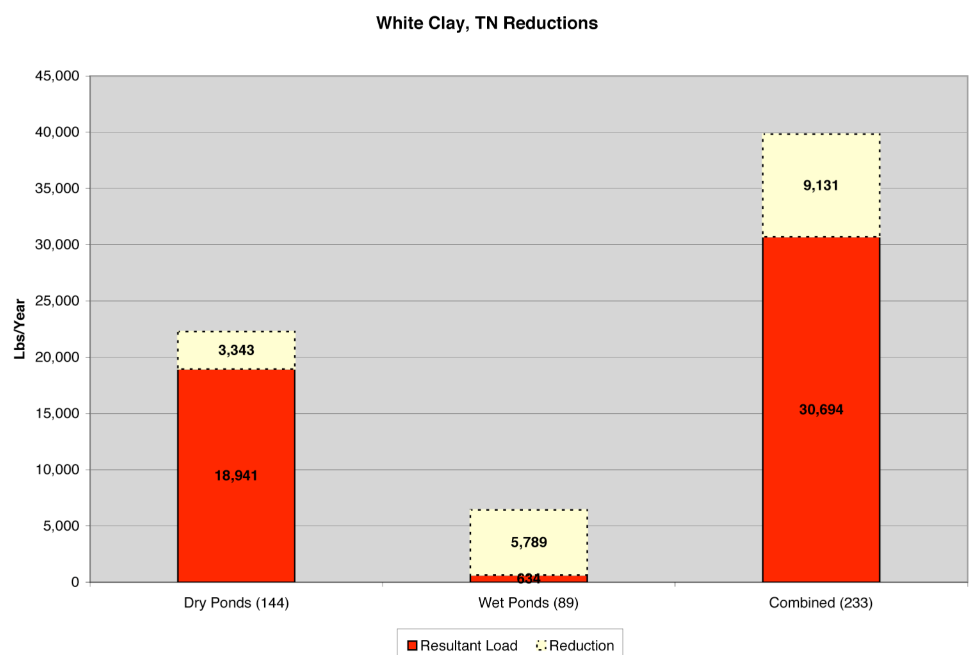

Figure 6.18 Reductions in total nitrogen from stormwater ponds in the White Clay Creek watershed, shown by yellow bar. The resultant load after treatment is represented by the red bar. Total load is shown by the full height of each bar. Total ponds=233 (144 dry ponds, 89 wet ponds).

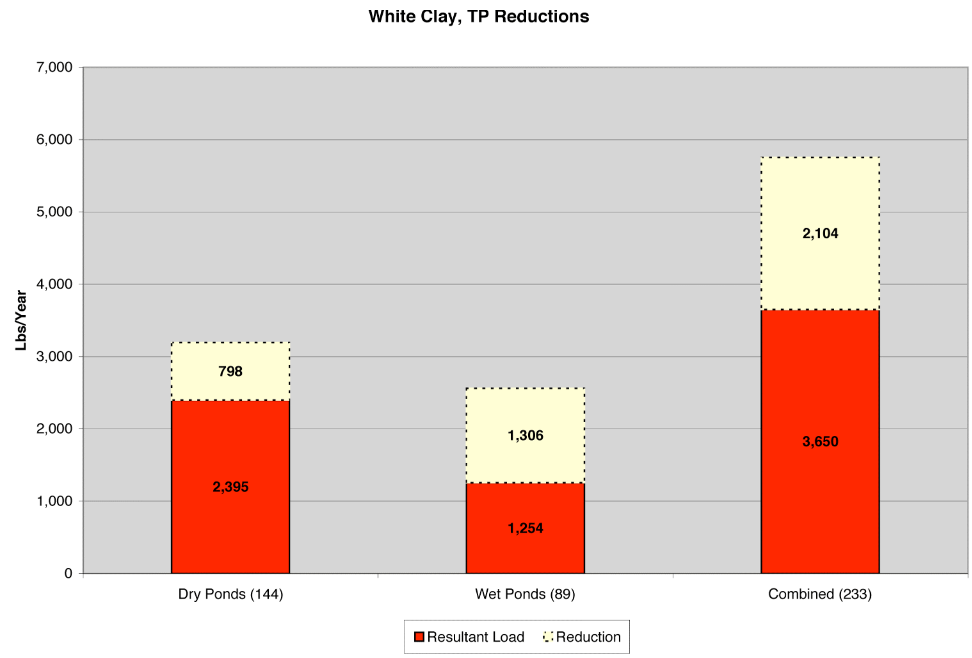

Figure 6.19 Reductions in total phosphorous from stormwater ponds in the White Clay Creek watershed, shown by yellow bar. The resultant load after treatment is represented by the red bar. Total load is shown by the full height of each bar. Total ponds=233 (144 dry ponds, 89 wet ponds).

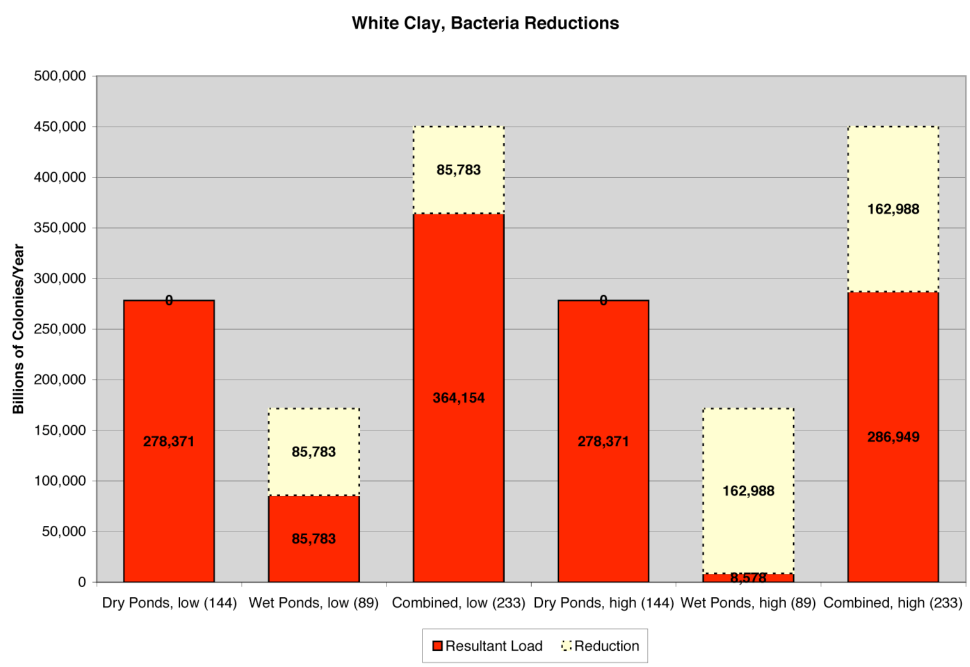

Figure 6.20 Reductions in bacteria (high and low ranges of removal efficiencies) from stormwater ponds in the White Clay Creek watershed, shown by yellow bar. The resultant load after treatment is represented by the red bar. Total load is shown by the full height of each bar. Total ponds=233 (144 dry ponds, 89 wet ponds).

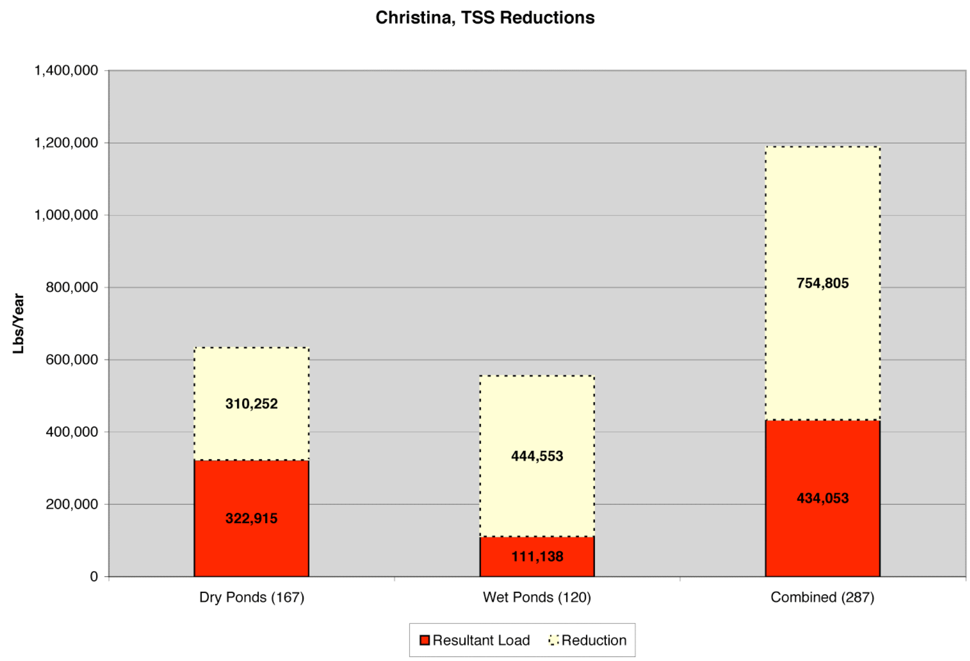

Figure 6.21 Reductions in total suspended sediment from stormwater ponds in the Christina River watershed, shown by yellow bar. The resultant load after treatment is represented by the red bar. Total load is shown by the full height of each bar. Total ponds=287 (167 dry ponds, 120 wet ponds).

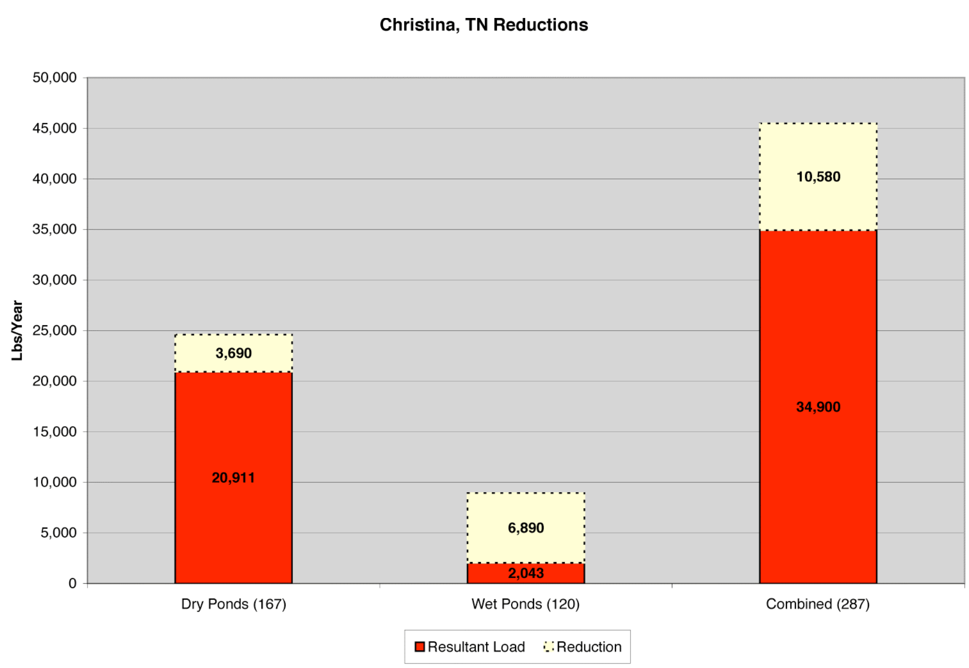

Figure 6.22 Reductions in total nitrogen from stormwater ponds in the Christina River watershed, shown by yellow bar. The resultant load after treatment is represented by the red bar. Total load is shown by the full height of each bar. Total ponds=287 (167 dry ponds, 120 wet ponds).

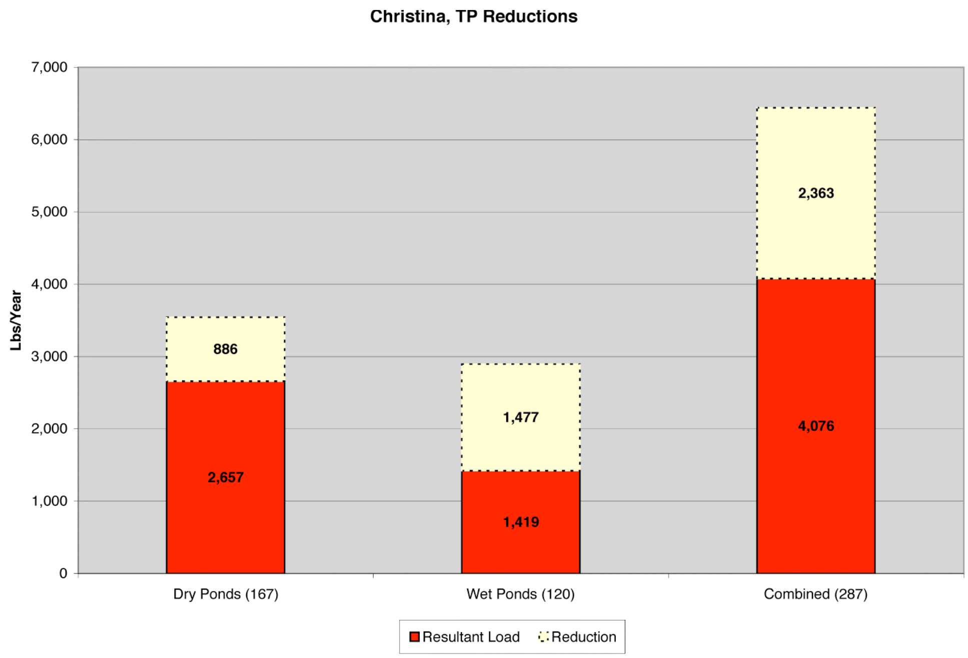

Figure 6.23 Reductions in total phosphorous from stormwater ponds in the Christina River watershed, shown by yellow bar. The resultant load after treatment is represented by the red bar. Total load is shown by the full height of each bar. Total ponds=287 (167 dry ponds, 120 wet ponds).

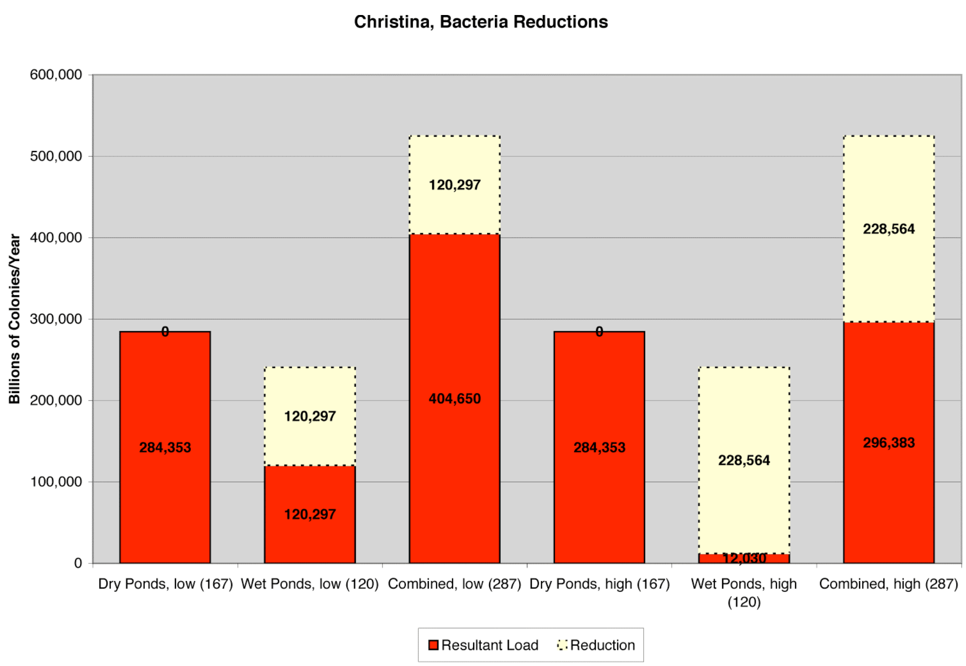

Figure 6.24 Reductions in bacteria (high and low ranges of removal efficiencies) from stormwater ponds in the Christina River watershed, shown by yellow bar. The resultant load after treatment is represented by the red bar. Total ponds=287 (167 dry ponds, 120 wet ponds).

VII. Maps

The following figure (Figure 7.1) illustrates four examples of typical subdivisions in areas with distinct development patterns, showing ponds and total catchment area. Land use patterns include open space (a golf course), a suburban area, a denser, commercial area, and an industrial site. The maps in Figures 7.2–7.5 illustrate the distribution of stormwater pond catchments in each of the four watersheds in the Delaware portion of the Christina Basin.

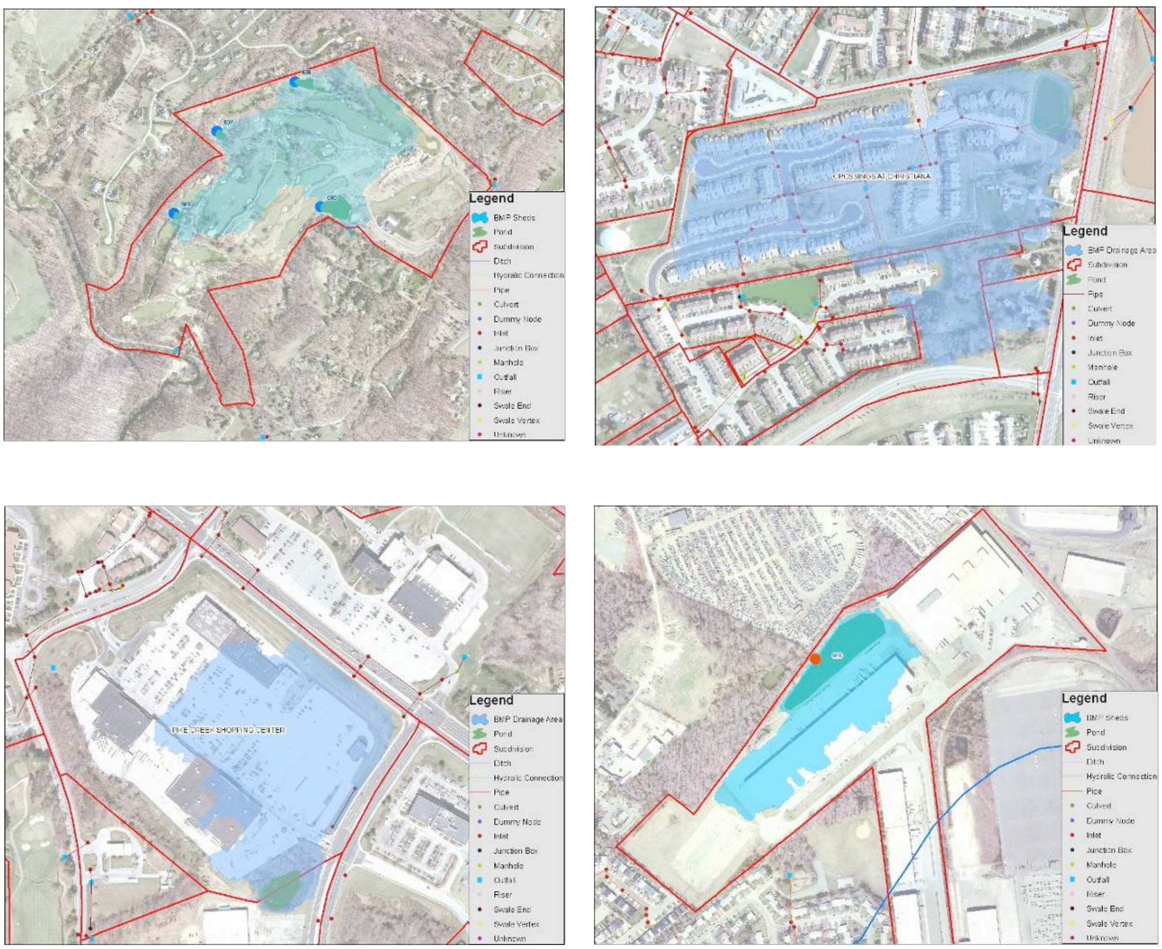

Figure 7.1 Map detail showing subdivision boundary, stormwater ponds, and pond catchment area, for an area of open space (upper left), suburban land use (upper right), commercial land use (lower left), and industrial land use (lower right).

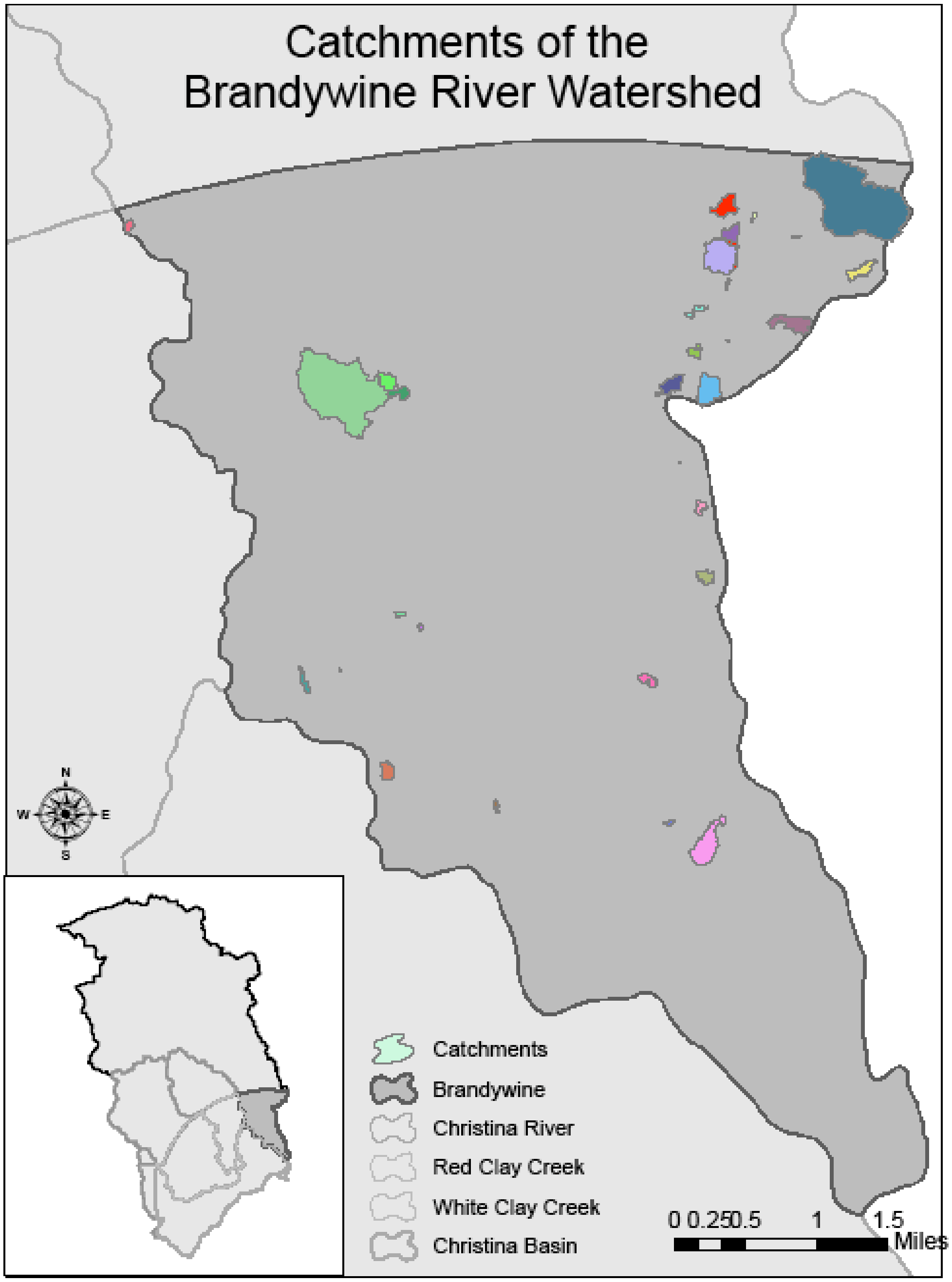

Figure 7.2 Stormwater-pond catchments in the Brandywine River watershed.

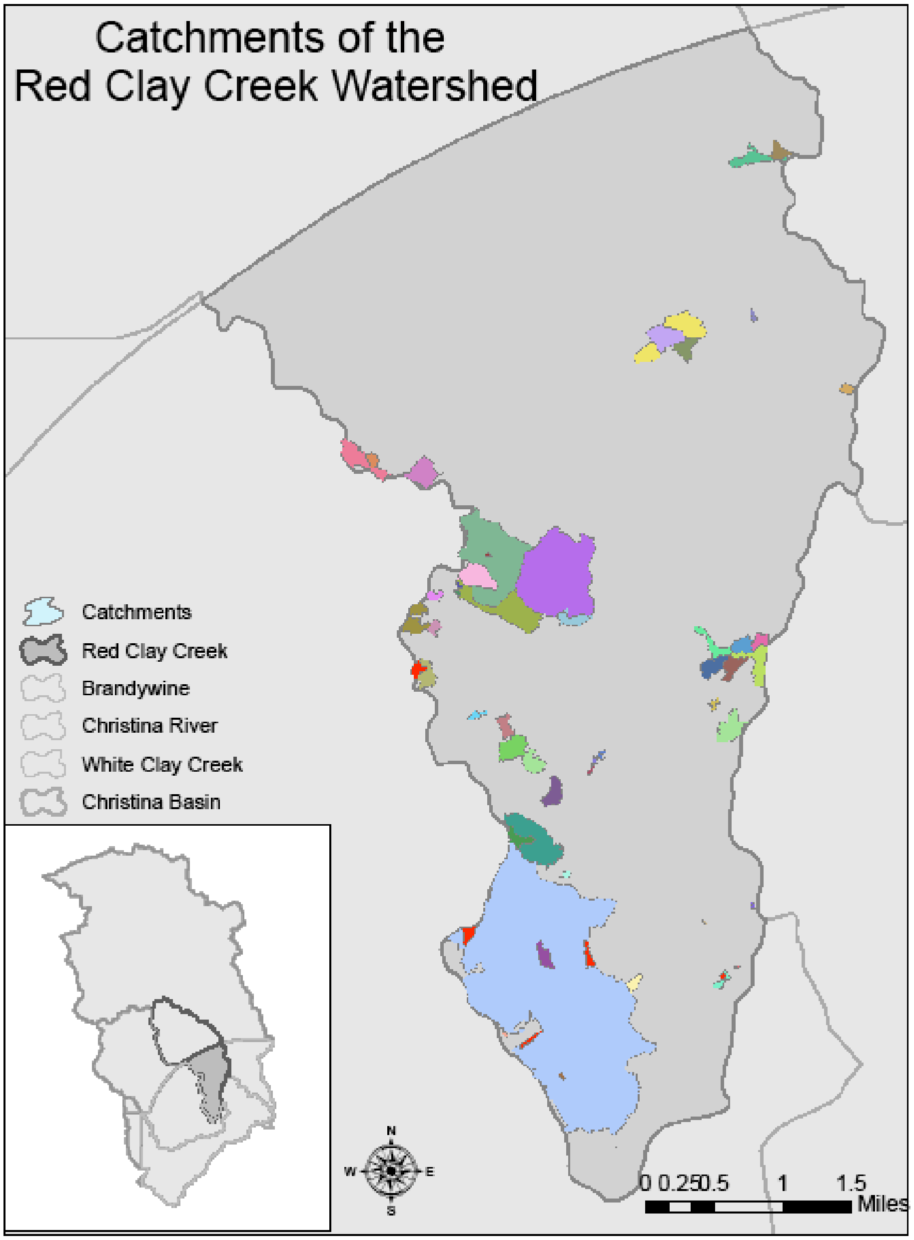

Figure 7.3 Stormwater-pond catchments in the Red Clay Creek watershed.

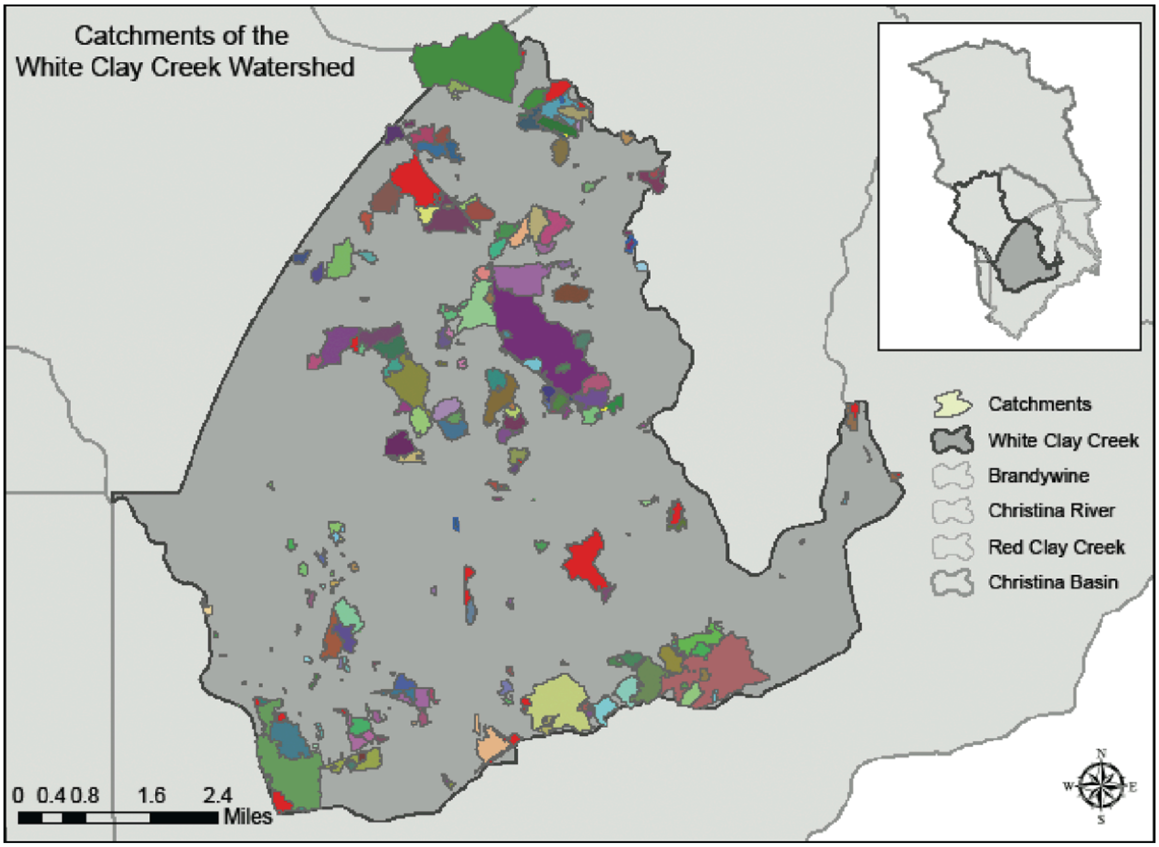

Figure 7.4 Stormwater-pond catchments in the White Clay Creek watershed.

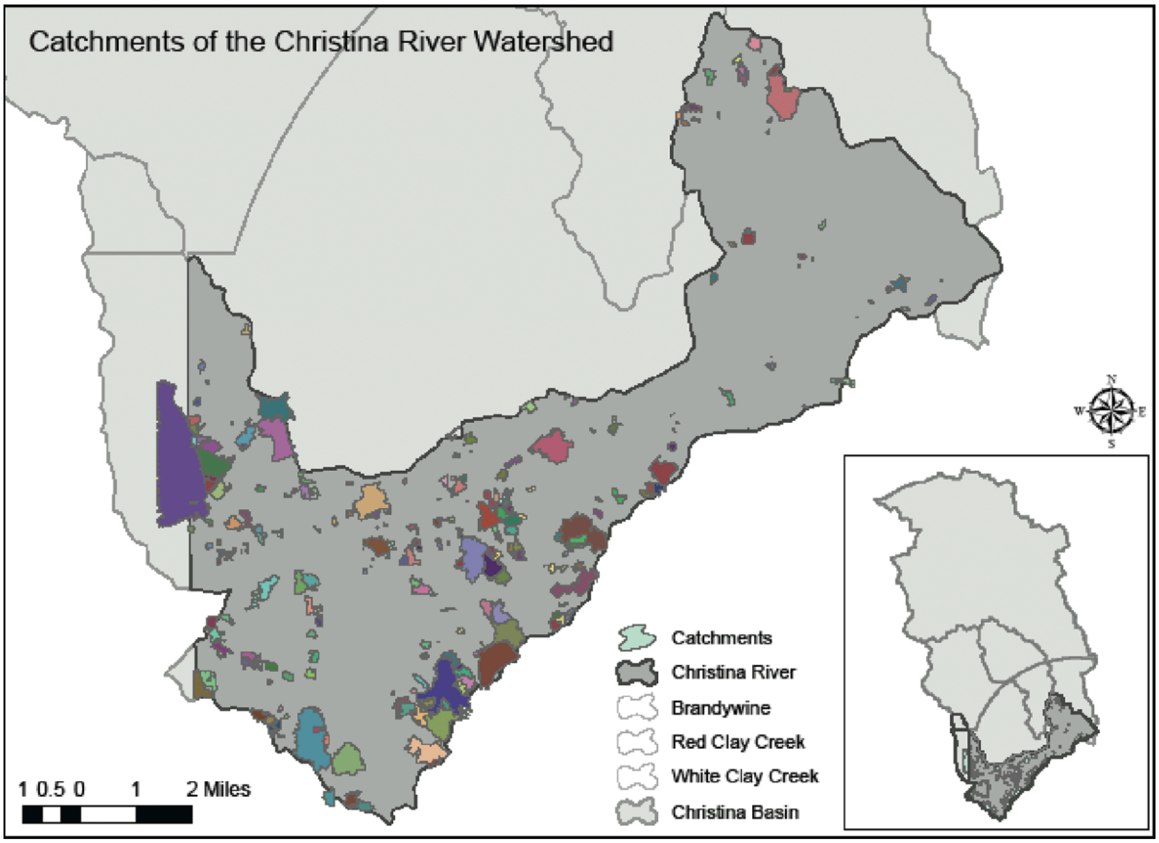

Figure 7.3 Stormwater-pond catchments in the Christina River watershed.

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Appendix A: Model Summary for Determining Load Reductions

The following is a summary of the models reviewed for determining the load reductions for total phosphorus, total nitrogen, total suspended sediment, and bacteria of wet and dry ponds for this project. The Schueler, or Simple Method, Long-Term Hydrological Impact Analysis (L-THIA), and Spreadsheet Tool for Estimating Pollutant Loads (STEPL) were analyzed. It was determined that the Schueler, or Simple Method was the best means of calculating load reductions for this particular project.

The Simple Method

Summary
Developed by Tom Schueler in 1987, the Simple Method estimates pollutant loads from stormwater runoff for various land uses. The Simple Method can also be used to calculate removal efficiencies of various best management practices to determine final pollutant loads for a specific drainage area (Center for Watershed Protection, n.d.). The Simple Method's calculations are based on basic empirical relationships (Ohrel, 2000). Pollutant loads are estimated as a product of annual runoff volume and pollutant concentration (Center for Watershed Protection, n.d.).

Calculations
Chemical constituents are calculated through the following equation:

$$\mathbf{L = 0.226 * R * C * A}$$

Where: L = Annual load (lbs)
R = Annual runoff (inches)
C = Pollutant concentration (mg/l)
A = Area (acres)
0.226 = Unit conversion factor

Bacteria concentrations are calculated through a modified equation:

$$\mathbf{L = 103 * R * C * A}$$

Where: L = Annual load (billion colonies)
R = Annual runoff (inches)
C = Bacterial concentration (1,000/ml)
A = Area (acres)
103.0 = Unit conversion factor

Annual runoff is calculated through the following equation:

$$\mathbf{R = P * P_j * Rv}$$

Where: R = Annual runoff (inches)
P = Annual rainfall (inches)
P_j = Fraction of annual rainfall events that produce runoff (usually 0.9)
Rv = Runoff coefficient

The runoff coefficient (Rv) is calculated based on impervious cover in the sub-watershed and is calculated through the following equation:

$$\mathbf{Rv = 0.05 + 0.9Ia}$$

Where: Ia = Impervious fraction

Total pollutant removal when taking into account stormwater-management practices can be calculated through the following equation:

$$R = L\,[(E_1)+(1-E_1)E_2+(1-((E_1)+(1-E_1)E_2)E_3+\ldots]$$

Where: R = Pollutant removal (lbs)
L = Annual load from Simple Method (lbs)
E_i = Efficiency of i^{th} BMP practice in a series

The calculations required of the Simple Method can easily be streamlined through the use of a spreadsheet or a GIS, provided that all required data are available (Center for Watershed Protection, n.d.).

Data Needs

The Simple Method requires relatively little information. Data needed includes: *sub-watershed drainage area*, *sub-watershed impervious cover percentage*, *stormwater runoff pollutant concentrations*, *annual precipitation*, *land use,* and *BMP removal efficiencies*.

For this study, impervious cover can be extrapolated by obtaining a raster data layer of impervious cover from the Delaware Office of State Planning Coordination website. Impervious cover layers are available for the entire state for the year 2007.

Stormwater-pollutant concentrations can be estimated from local, regional, or national data sources.

Specific sources of stormwater pollutants vary in their concentration amount and can be estimated from available data sources, but most likely will not be necessary for our research purposes.

Pollutant-removal efficiencies are available from various sources for several BMPs, including wet ponds, stormwater ponds, filtering practices, infiltration practices, and water-quality standards.

Benefits

The Simple Method is very easy to use, compared to more complex computer-based stormwater modeling. The Simple Method is useful for quick and reasonable load estimating (Ohrel, 2000). Calculations can be streamlined through use of a GIS or a spreadsheet.

Limitations

Several caveats about the Simple Method must be considered before determining whether or not the model is appropriate for specific research purposes. The Simple Method should not be used in watersheds over 640 acres (Ohrel, 2000). More complex modeling may be more appropriate for larger drainages. The Simple Method is not appropriate for comparing the pollutant removals for subdrainages with similar impervious cover percentages (Center for Watershed Protection, n.d.). Another caveat is that the Simple Method does not take into account background or erosional sources of pollutants (Ohrel, 2000). Additionally, Ohrel (2000) advises that the Simple Method not be used in assessing non-urban land uses (including construction sites, industrial areas, rural development, and agricultural uses) because of the unreliability of available "C" values for pollutant concentrations, which are the flow-weighted mean concentrations of pollutants in urban runoff (usually in mg/l). The National Urban Runoff Program's (NURP) C values for stormwater pollutants may not address regional and seasonal variations in pollutant concentrations and may not account for increased pollutant-reduction measures that have occurred since the values were established.

Long-Term Hydrological Impact Analysis (L-THIA)

Summary

The Long-Term Hydrologic Impact Analysis (L-THIA) model was developed by Purdue University as an online tool intended for policy- and decision-makers to assess the hydrological impacts of land use change based on climate data, soils data, and land use data. These include estimates of runoff, recharge, and non-point-source pollutants to determine long-term effects of land use change (Engel & Harbor, n.d.; Ma, 2004). L-THIA calculates average annual surface runoff and non-point-source pollutants in numerical format, as well as charts and maps. L-THIA is based on estimates resulting from the collection of 30 years of precipitation data. It produces its calculations based on averages, not single events or storm events. L-THIA is available in three versions: the basic spreadsheet, which estimates runoff and NPS pollutants, L-THIA GIS model, which uses ArcView to determine the impacts of runoff, and L-THIA GIS WWW, which is an interactive web version concentrating on a specific area of interest. (Engel & Harbor, n.d.)

Calculations

No calculations are completed by the user. They are all calculated by L-THIA.

Data Needs
The input data includes: *climate, land use, geographic location*, *curve number* (determined by USDA Soil Conservation Service), and *soil type* (based on the Natural Resource Conservation Service Hydrological Soil Groups). The curve number is used to determine the amount of runoff in an average stormwater event (Engel & Harbor, n.d.; Ma, 2004).

Output
The following is a list of output provided by L-THIA and the format of the output:

Output	Format
Average annual runoff volume	Tabular
Average annual runoff depth	Tabular
Average annual runoff volume	Bar chart
Average annual runoff depth	Bar chart
Runoff depth	Bar chart
Land use area	Bar chart
Land use	Pie chart
Average annual runoff volume	Pie chart
Annual variations in runoff	Time series graph
Percent of exceedence for runoff	Time series graph
Non-point source pollution for the following pollutants: -nitrogen -phosphorus -suspended solids -lead -copper -zinc -cadmium -chromium - nickel -BOD -COD -oil and grease -fecal coliform -fecal streps	NPS pollutants map, if applicable
Source: Engel & Harbor (n.d.)	

Benefits
A major benefit of L-THIA is its simplicity. Only basic information is required by the user, including the location (county and state), soil type, previous and current land uses, and the change in area. The land use data options are limited to commercial, industrial, high and low residential (broken down into 1/8, ¼, 1/3, ½, or 2 acre parcels), open space, parking/paved, water/wetland, grass/pasture, forest, agriculture, percent impervious cover, or custom. L-THIA can model areas greater than 100 square miles but should be used on the site level. (Engel & Harbor, n.d.)

Limitations
The aim of L-THIA is primarily for a quick measurement of the environment and is not intended for an in-depth analysis for the planning of stormwater drainage systems. For modeling larger areas, L-THIA would only be able to estimate surface runoff, not estimated stream flow attributed from groundwater. L-THIA is only applicable to areas where the Curve Number Method is used. Another drawback is that L-THIA does not

take all forms of precipitation into consideration, such as snowfall. It also does not account for the frozen ground and its tendency to increase runoff. Finally, L-THIA neglects differences in moisture levels. (Engel & Harbor, n.d.)

Spreadsheet Tool for Estimating Pollutant Loads (STEPL)

Summary

STEPL determines the load reductions of N, P, BOD and sediment loads from the implementation of BMPs. It measures nutrient and sediment loads on a watershed basis by land use type (cropland, urban, pasture, forest, feedlot, and others). The sources of pollution loads are analyzed in terms of their runoff and erosion/sedimentation before and after implementing BMPs (Dai & Matzke, 2006; Dai, Manguerra, and Romell, n.d.).

Calculations

The STEPL model uses basic algorithms to calculate BMP load reductions, hydrology, nutrient, and sediment algorithms. A customized Excel worksheet serves as the STEPL BMP calculator, which can be downloaded from it.tetratech-ffx.com/stepl (USEPA, 2007). The STEPL model uses four steps to determine the load reductions of specific BMPs (Dai & Matzke, 2006; Dai et al n.d.).

Data Needs

According to Dai and Matzke (2006) and Dai et al. (n.d.) the STEPL model uses four steps to determine BMP load reductions described below:

Step 1 breaks down land use into the following categories: urban, pasture, cropland, forest, feedlot, or other. The data provided by the user include: *land use area, animal counts*, and *septic system failure*. The default data in Step 1 are precipitation and soil characteristics.

Step 2 calculates the annual load prior to BMP. It uses the Curve Number Method to determine annual runoff of all land use areas, except urban. The Universal Soil Loss Equation (USLE) is used to calculate erosion. Sediment is then determined by multiplying erosion by the delivery ratio. The concentration is default data determined by land use. Loads are determined by multiplying the export coefficient by the source area for urban land use. For other land uses it is dissolved concentration times runoff volume and soil concentration times sediment volume.

Step 3 selects a single BMP or multiple BMPs by land use. For example, some of the options include filter strips, infiltration basin, runoff mount system, or no BMP.

Step 4 calculates annual pollutant load after BMP implementation. In this step, load reduction is determined by multiplying the load before BMP by BMP efficiency. The load after BMP implementation is calculated by subtracting the load reduction from the load before BMP implementation. Note: loads are amassed by watershed.

The data are either provided by the user, for the load reductions of specific BMPs. Or they are default data provided for the calculations within the spreadsheet. The following is a list of the data sources:

- Rainfall: NOAA
- USLE values by county: NRCS 1997 Natural Resources Inventory (NRI)
- Literature values
    - Runoff and soil-pollutant concentrations
    - BMP list and efficiencies
    - Household wastewater characteristics, etc.
- Other data can be found on-line (e.g., animal count from USDA Census of Agriculture)
- Uses 8-digit HUC codes for determining watersheds.

Benefits

According to Dai and Matzke (2006) and Dai et al. (n.d.), the features of STEPL are such that it calculates load reductions at the source with multiple BMPs and various land uses for combined efficiency. It can also determine the load reductions for multiple sub-watersheds and on a watershed level. It also provides the option to either take the transport effect of the entire watershed into consideration or measure each sub-watershed individually. Another aspect of STEPL is the option to calculate shallow groundwater-pollutant loads on a watershed basis. From user provided data, STEPL can calculate gully and streambank erosion and groundwater pollution and data on stabilizing efficiencies.

Limitations

Initially, one stipulation for the project was measuring the load reductions of total nitrogen, total phosphorous, total suspended sediment, and copper. A significant drawback of STEPL is that it does not measure copper. A knowledge and understanding of BMPs and how they function within the watershed is also required (Dai & Matzke, 2006; Dai et al., n.d.).

Appendix B: Land Use Category Mappings

The following table presents the mapping of categories of land use from the 2007 State of Delaware Land Use and Land Cover dataset to those used in the loading model (the Simple Method).

Land Use, 2007 data	Land Use, Simple Method
Single Family Dwellings	Residential
Multi Family Dwellings	Residential
Mobile home Parks/Courts	Residential
Commercial	Commercial
Retail Sales/Wholesale/Professional Services	Commercial
Vehicle Related Activities	Commercial
Junk/Salvage Yards	Industrial
Warehouses and Temporary Storage	Commercial
Other Commercial	Commercial
Industrial	Industrial
Highways/Roads/Access roads/Freeways/Interstates	Street
Parking Lots	Parking Lot
Railroads	Industrial
Airports	Commercial
Communication - antennas	Commercial
Marinas/Port Facilities/Docks	Industrial
Utilities	Industrial
Mixed Urban or Built-up Land	Commercial
Other Urban or Built-up Land	Commercial
Institutional/Governmental	Commercial
Recreational	Lawns
Cropland	Agriculture
Pasture	Agriculture
Idle Fields	Agriculture
Truck Crops	Agriculture
Farmsteads and Farm Related Buildings	Agriculture
Other Agriculture	Agriculture
Herbaceous Rangeland	Open Space
Shrub/Brush Rangeland	Open Space
Mixed Rangeland	Open Space
Deciduous Forest	Forest
Evergreen Forest	Forest
Mixed Forest	Forest
Clear-cut	Open Space
Waterways/Streams/Canals	Water/Wetland
Natural Lakes and Ponds	Water/Wetland
Man-made Reservoirs and Impoundments	Water/Wetland
Bays and Coves	Water/Wetland
Tidal Open Water	Water/Wetland
Non-tidal Open Water	Water/Wetland

Non-tidal Forested Wetland	Water/Wetland
Non-tidal Scrub/Shrub Wetland	Water/Wetland
Non-tidal Emergent Wetland	Water/Wetland
Tidal Scrub/Shrub Wetland	Water/Wetland
Tidal Emergent Wetland	Water/Wetland
Extraction	Industrial
Transitional (incl. cleared, filled, and gra	Open Space
Tidal Shoreline	Water/Wetland
Non-tidal Shoreline	Water/Wetland

Appendix C: Stormwater-Pond BMPs Requiring Review

This table indicates where there were significant difficulties or issues identifying stormwater BMPs in the dataset, based on aerial photography or field reconnaissance. Cells bolded indicate ponds which were not delineated for this study.

BMPID	858/54	this whole area - double check.	EDF - Appears to be in stream. Fixed.
BMPID	426	double check - is it draining the outfall?	EDF - Ok.
BMPID	446	double check - is it draining the outfall?	EDF - Ok.
BMPID	262	pond is actually a catchbasin and system has been merged with BMPID 262	EDF - Fixed Ok.
BMPID	241	double check	EDF - Ok.
BMPID	344	pond does not drain anything	EDF - Fixed.
BMPID	292	uncertain where pond is located	EDF - Fixed and delineated.
BMPID	352	uncertain where pond is located - did not delineate	**EDF - Can't find either. Not delineated.**
BMPID	1145	uncertain where pond is located. Pond delineated, but not in subdivision. Look at the description of the pond	EDF - Agree, pond should be behind church.
BMPID	1146	delineated pond, but not in subdivision	EDF - Ok.
BMPID	39	confusing. I delineated pour points, but not certain if they are correct. There is one outfall that leads to an inlet and to the pond, but the outfall also a ditch which does not drain to the pond - it is just to the left of the pond.	EDF - Fixed.
BMPID	611	pond is not obvious	**EDF - Can't find either. Not delineated.**
BMPID	860	pond is not obvious	**EDF - Can't find either. Not delineated.**
BMPID	864	pond is not obvious	**EDF - Can't find either. Not delineated.**
BMPID	191	uncertain where pond is located	**EDF - Can't find either. Not delineated.**
BMPID	897	uncertain where pond is located	EDF - PP is in a sports field. Delineated but not sure if it is right.
BMPID	423	not certain where the pond is. delineated a pp, but not located in the Christina	EDF - I think it is ok.
BMPID	422	uncertain where pond is located	**EDF - Can't find either. Not delineated.**
BMPID	421	uncertain where pond is located	**EDF - Can't find either. Not delineated.**
BMPID	10119	where is it?	**EDF - Not in attribute table. Not delineated.**
BMPID	576	uncertain where pond is located	EDF - Delineated but not sure if it is right.

BMPID	894	uncertain where pond is	**EDF - Can't find either. Not delineated.**
BMPID	960	uncertain where pond is	EDF - Delineated and fixed.
BMPID	865/867	uncertain which pond	EDF - Ok- both ponds are for same PP.
BMPID	1037	uncertain where pond is	**EDF - Can't find either. Not delineated.**
BMPID	1038	is this a pond?	EDF - Yes I think it is a pond. Delineated.
BMPID	213		**EDF - Not in attribute table. Not delineated.**

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