ABSTRACT

URBAN STORMWATER MANAGEMENT AND EROSION AND SEDIMENT CONTROL: AN INTERNSHIP WITH THE BUTLER SOIL AND WATER CONSERVATION DISTRICT

by Joel Patrick Thrash

The purpose of this report is to describe the activities of my internship with the Butler Soil and Water Conservation District (Butler SWCD) from May 2004 through February 2005. The District is a publicly funded subset of both the State of Ohio and Butler County whose primary goal is to provide technical and educational programs that assist landowners and residents in the protection and management of their natural resources. Since the primary focus of the internship was urban resource conservation, this report summarizes principles of stormwater management, water resource protection and sediment and erosion control specifically related to urban landscapes. Individual and collective applications of management strategies during the internship are fully discussed. Principle responsibilities included drafting new standards for stormwater pollution prevention plans (SWPPP) and reviewing individual site plans against those standards while continuously inspecting compliance with state and local regulations. A significant portion of time was spent developing ordinances and executing best management practices (BMPs) spelled out the Butler County Phase II Stormwater Management Plan, and numerous special projects are described.

URBAN STORMWATER MANAGEMENT AND EROSION AND SEDIMENT CONTROL: AN INTERNSHIP WITH THE BUTLER SOIL AND WATER CONSERVATION DISTRICT

An Internship Report

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Master of Environmental Science

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by

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DEDICATION

This report is dedicated to my wife, Carrie Beth

I. INTRODUCTION

In order to complete the research requirement for a Masters of Environmental Science (M.En) through Miami University's Institute of Environmental Sciences (IES), a six-month internship with a sponsoring agency must be successfully completed and defended. The internship is intended to provide students with the opportunity to take on real environmental projects, solve problems, and complete job duties related to their area of concentration (IES Manual, 2002). During my graduate study, I became keenly interested in identifying, assessing, and managing water resources through the application of scientific research and the implementation of best management practices. I elected to complete my internship with the Butler Soil and Water Conservation District (Butler SWCD), a local agency responsible for the challenge of properly managing soil and water resources on behalf of a number of municipalities and across a variety of disparate land uses.

My internship with Butler SWCD began on May 3, 2004 as an Urban Technician. The position was created as a full-time arrangement through the Butler SWCD with job duties and responsibilities to be performed across other state and local agencies, most notably the Butler County Stormwater District. The location and position were appealing for a number of reasons, primarily for the District's experience concerning real interdisciplinary problems and for the numerous threats impairing the county's diminishing, yet invaluable resources including but not limited to perennial rivers and streams, extensive groundwater deposits, isolated upland wetlands, floodplains, riparian corridors, and connected forests. But even more appealing than that, Butler SWCD provided an ideal opportunity to use my knowledge, skills and abilities as I saw fit to fulfill the demands of the position and to meet the needs of an evolving District in a heavily urbanizing county.

Defining the Problem

Like many areas nationwide, Butler County experiences some of the most common problems degrading water quality and complicating watershed management today. No degradation is more common or contributes more to these problems than sediment loading from diffuse or non-point sources of overland flow. Within the context of this internship, nearly every water quality issue and management concern encountered was directly related to non point source runoff and sediment loading. To better understand the scope of this problem

and limitations with its management, the existing landscape and surface hydrology must be understood. Without such a background, the management of soil and water resources is impossible when differentiating natural from unnatural impacts to such resources.

Large deposits of till from Pleistocene glacial drifts cover over 80% of Butler County's land surface area (Lerch et. al, 1980). In most cases these deposits exist as ground moraine composed of fine grained sediments, predominately silts and clays. Because the till was fairly homogenous in Butler County, soils have a rather uniform, moderately fine to fine-grained texture. The largest soil deposits in the county which include the Eden, Miamian, and Russell series were topped with silty loess and derived from fine-grained sedimentary substrate. All of these natural properties - silty-clay till, predominately loamy soils, and silty loess - make for highly erodeable soils when topography is considered. Topographical factors such as elevation changes and steep slopes on stream valleys are common in all but the SE portion of the county (Lerch et. al, 1980).

Naturally, these physiographical soil properties make Butler County deposits highly mobile, subjecting upland areas to increased rates of natural erosion and causing deposition of those sediments in local waterways. Once suspended in a surface water column, fine grained sediments such as these are often carried great distances. These surface layer deposits in combination with the underlying interbedded limestones and shales also make for poorly drained surfaces. In fact, even the roughest estimates suggest that runoff coefficients for virgin areas of SW Ohio are upwards of 30% (Bartels et. al, 1993). These two basic components to the problem - highly mobile sediments in upland areas and significant overland runoff - contribute greatly to the sediment fluxes observed throughout Butler County watersheds including TSS and turbidity levels measured in the main basin outlet, the Great Miami River (Miami Conservancy, 2002).

There is also another factor to consider. Under certain circumstances, the properties of the landscape described above make for unpredictable runoff patterns with regards to basin hydrology. This is especially true during large rain events as well as between times of drought and plentiful precipitation. Thus, the 'flashiness' of surface water flows in between significant hydrologic extremes makes riparian erosion another threat to the overall problem of sediment loading. Riparian erosion refers to scoring, stream bank degradation, and fluvial instability resulting from flows within the stream channels themselves. This 'additional'

source of sediment is rarely studied and oft ignored in terms of management; nonetheless, studies have shown that in some instances roughly 30-80% of all sediment yields come from stream channels themselves (Simon et. al, 2000), particularly channels within watersheds that have a great deal of topographical relief.

Many Butler County streams experience sediment loading from both highly erodeable upland areas as well as stream banks themselves. However, urban development and shifting land use patterns have intensified the problem on both fronts. The increase in impervious surfaces from urbanizing areas have been shown to increase the volume and rate of runoff, ultimately causing receiving streams to flow faster and approach the bankful width at more recurrent intervals (Konrad, 2002). This more intensive flow increases scouring and erosion in the channels themselves. On the other hand, the actual earth disturbing activities that occur in the uplands are more of a problem in Butler County as compared to many others because, as demonstrated, the soils are easily erodable and highly mobile. Upland disturbances have become such a problem that the USEPA has now mandated every state to regulate construction over one (1) acre in size (Ohio EPA, 2003); recognizing the impact in Butler County, the local Stormwater District is in the process of adopting further ordinances to manage this construction. Nevertheless, shifting land uses and intense development in Butler County has greatly exacerbated both sources of sedimentation: upland and riparian.

Interestingly, this problem exists across multiple spatial scales and broad land uses nationwide. While the geological properties and surface hydrology outlined above help explain why sediment loading occurs, it does little to account for the anthropological effects, the non point sources of runoff, nor the associated water quality impairments that plague Butler County streams. In fact, sediment and nutrients have been described both nationally and locally as the chief pollutants responsible for streams not meeting attainment status (Ohio EPA 303(d)). Since it was officially classified as a pollutant in 1992, sediment has remained the largest source of pollution in the United States in terms of volume, weight, and flux. The problem in Butler County is at the least no different and arguably greater, yet the control of soil loss and management of soil and water resources remain overwhelming.

In Butler County, land use is a critical factor to consider within the context of the problems surrounding soil erosion and sediment pollution. Agricultural production has been and continues to be the most dominant use of the land. Despite improvements in tillage,

conservation practices, and technology; soil loss from this type of land use can still approach levels of 5 to 15 tons/ac/yr. Runoff from agricultural activities includes sediments, nutrients (fertilizers), and bacteria (animal waste). Across the country, these three non point source pollutants have been identified as chief causes of water bodies failing to meet water quality goals set forth in the Clean Water Act. The Ohio EPA, in its report to the USEPA, has recently identified several rural, agricultural water bodies in Butler County as failing to meet attainment status despite the hard work of landowners and the Butler SWCD to control non point source pollution. Table 1 shows a list of impaired waters in Butler County.

Watershed	Assessment Unit	AU Code	Projected TMDL Date	Impairments
Four Mile Creek	05080002 070	5	2006	Sed/Nutrients
Great Miami River	05080002 050	5	2011	All
Mill Creek	05090203 010	5	2004	All
Sevenmile Creek	05080002 060	5	2006	Sed/Nutrients
Whitewater River	05080003 001	5	2012	Sed/Nutrients

Table 1. Impaired Water Bodies in Butler County as determined by 303(d) list in Federal Register

Amazingly, agricultural pollutants are just a part of the problem. Butler County has lost over 22,500 acres of its farmland in the last decade as patterns suggest that the remaining operations are consolidating (Bartels, 1999). Agricultural land now converted to urban development is even more of a problem with respect to sedimentation and associated pollutants. Development in Butler County has transformed the landscape by increasing the amount of impervious surface areas, and the water quality impairments from such urban land uses are derived from an even greater number of sources than agricultural land uses. Impacts include sediment during construction, hydrocarbons from roads and parking lots, and organics from post-constructed surfaces to name a few. The result is that such pollution is diffused across land uses and land area. Its actual sources are not easily located. Many of the receiving streams in Butler County have been severely impaired by such unnatural sediment fluxes, nutrient loading, and urban pollutants. One watershed, the Mill Creek, has already been given non point source loading requirements by the USEPA (Ohio EPA TMDL, 2004).

Sediment has been and continues to be identified as the principle pollutant degrading water quality in the majority of Ohio and Butler County streams (Table 1). The Butler

SWCD, along with several other sponsoring agencies, have made it an annual mission to minimize the numerous water quality impacts from sediment loading in urban and agricultural settings throughout the county. The following is a general summary of the impacts that sedimentation has had on comparable waterbodies in southern Ohio (Hunt and Grow, 2001)

- Increase in water treatment costs
- Increase in Volume (V) and rate (Q) of runoff as surfaces are exposed
- Transport of nutrients and promotion of eutrophic conditions
- Transport of positively charged ions, including As, Hg, Cd, Pb
- Alteration of recreational uses of receiving streams and reservoirs
- Increase in costs related to lake, basin, and ditch removal
- Reduction in stream capacity, scouring, and flooding
- Increase in turbidity
    - -Blockage of sunlight needed for photosynthesis
    - -Aesthetically unpleasing
- Increase of In-Stream Deposition
    - -Warmer temperatures, lower dissolved O_2
    - -Destroys benthic habitats
- Alteration of aquatic (and some terrestrial) food chains at the primary trophic level

Like many environmental problems, these impacts and challenges are further complicated by limitations such as jurisdictional political boundaries, economic status and land use. Butler County houses more than 30 units of local government spanning across seven (7) principle watersheds, inherently creating a contentious management atmosphere in terms of disparate rules and regulations regarding water resources (Figure 1). The county as well as the local municipalities and townships also have strikingly different levels of economic stability and household income. This affects such resources by the quality of development surrounding them and the kind of protection given during planning and construction. Streams in Liberty Twp, for instance, can flow through upscale developments where a great deal of restoration and bank stabilization occurs; while downstream, a mobile home park discharges untreated wastewater that impairs the remainder of Gregory Creek. Conflicts with approved land uses and inconsistencies with zoning requirements between county and local planning departments are also major limitations in managing resources within a watershed context. Most land use planning in the county tends to be derived from values other than environmental protection, making smart growth and natural resource management more difficult.

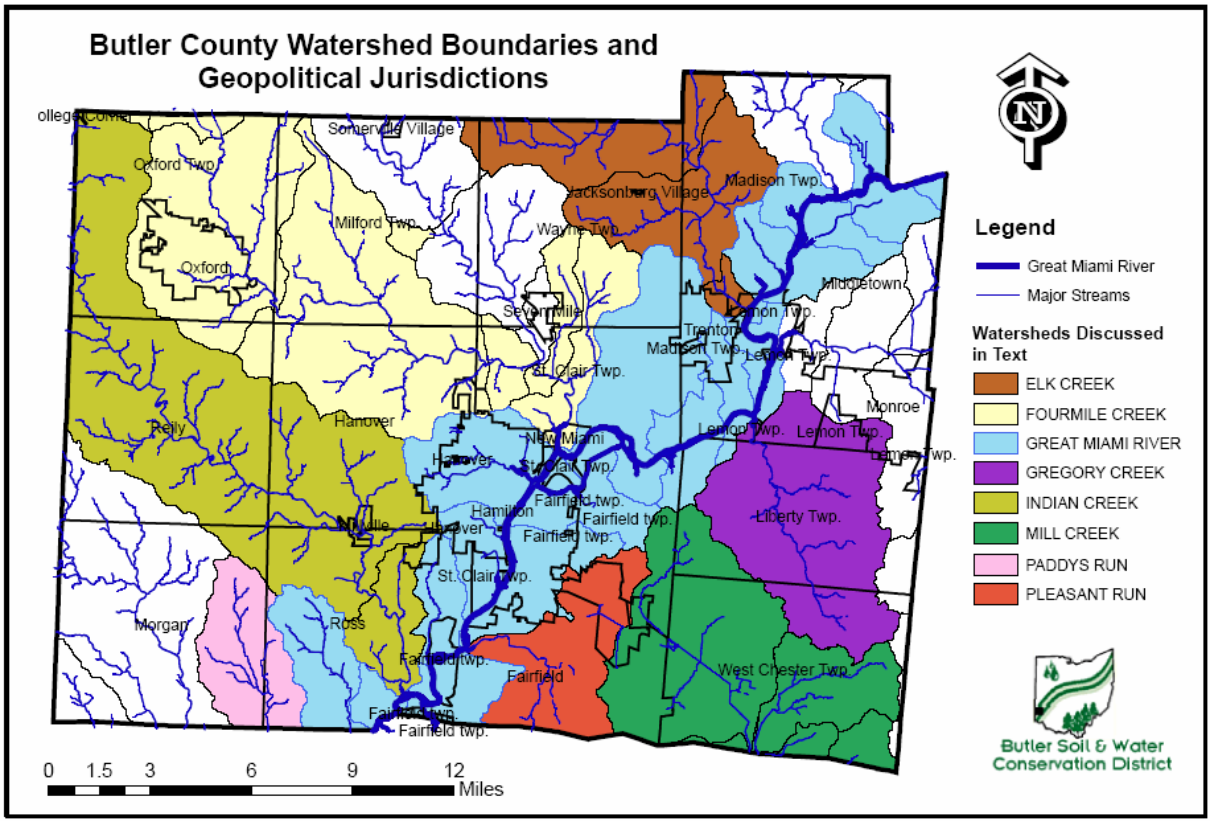

Figure 1. Butler County Watershed Boundaries and Geopolitical Jurisdictions

Perhaps more than any other reason, Butler County provided an ideal setting for a professional experience in the field of water resource management because of its rapid rate of land transition. Identified as losing more than 22,500 acres of farmland in the last decade alone (Bartels, 1999), Butler County ranks among the five most rapidly developing counties in the state. The demand for such growth has brought urban development pressures that take a significant toll on the both the public welfare and local environment. The conversion of land from predominately rural, agricultural operations to higher density, residential and commercial developments has drastically altered the central to southeastern landscape of Butler County. While much of the development has been indispensable in building strong public schools, improving quality of living, and even remediating past environmental problems; the impacts of such rapid growth have put Butler County and the Butler SWCD behind in at least two critical arenas: stormwater management and erosion and sediment control. My internship with the Butler County SWCD focused on these interconnected problems.

History of Soil and Water Conservation Districts (SWCDs)

The first governmental recognition of soil erosion and its potential impacts in the United States was the passage of the Buchannon Amendment to the Agriculture Appropriation Bill enacted by Congress in 1929. The amendment appropriated $160,000 to the United States Department of Agriculture (USDA) for the investigation of erosion and its effects on farms throughout the United States (ODNR, 1998). While this provided the first legal framework for soil and water conservation issues, it was not until the public outcry following the 1934 Dust Bowl that conservation issues received national attention. In response to the disaster, Congress passed the Soil Conservation Act in 1935 establishing the USDA's Soil Conservation Service (now known as the Natural Resources Conservation Service (NRCS)).

The establishment of this agency was an invaluable step to provide funding and educational resources to the agricultural community. However, barriers continued to exist between the federal government and individual landowners. Realizing that the future trust and long term cooperation of landowners would depend on coordination by federal, state, and local government, Congress passed a resolution calling for states to become the conduit for soil and water conservation assistance from the USDA to landowners. This resolution allowed for the establishment of state conservation agencies and outlined the procedures whereby local soil and water conservation districts could be organized (ODNR, 1998). In 1941, Ohio's 94th General Assembly passed House Bill 646, which later became the Ohio Soil Conservation District Enabling Act. The act paved the way for the formation of local conservation districts, which in Ohio, meant that all 88 counties could receive assistance for the establishment of individual county soil and water conservation districts (SWCDs). These districts continue to serve as the community contact and program delivery mechanism for agricultural resource conservation services from the federally mandated Farm Bill (ODNR, 1998)

While agricultural conservation practices were the first to receive attention and funding, many urbanizing counties have transformed their conservation districts to meet the needs of county residents, particularly in the area of soil and water conservation and stream protection. Districts have formed extensive education and outreach programs to both urban and agricultural landowners, and many districts have evolved to support urban programs

which do everything from providing technical assistance to regulating provisions spelled out in local development ordinances and even the Clean Water Act (CWA)

Butler SWCD

Butler SWCD is a subdivision of the state of Ohio and was organized in May of 1942 by concerned landowners interested in protecting and improving soil and water resources in the county. The District is publicly funded by the Butler County Commissioners and state-matched by the Ohio Department of Natural Resources (ODNR), Division of Soil and Water Conservation. Located on the outskirts of the county seat, Hamilton, OH, the Butler SWCD office also houses members of the United States Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) and Farm Services Agency (FSA), two invaluable partnerships that allows the office to provide federal funding and cost sharing to farmers interested in implementing conservation practices on their land.

Under the direction of an independently elected Board of Supervisors, the Butler SWCD provides urban and agricultural assistance to over 140,000 people in the unincorporated areas of Butler County as well as educational programs to every school in the county and technical assistance to every property owner in the county. The District employs a staff with a range of backgrounds and capabilities based on local needs, and all employees serve at the will of the Board of Supervisors (Figure 2)

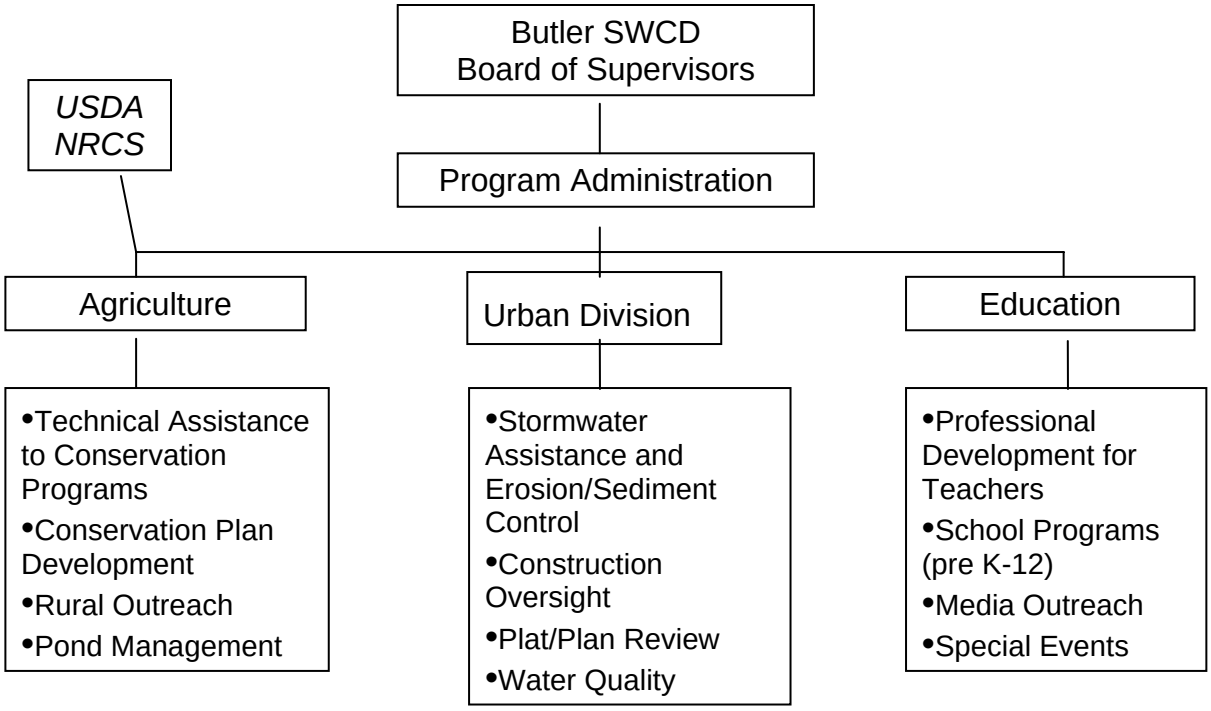

Figure 2. Organizational Flow Chart for Butler SWCD

The goal of the District is to provide technical and educational programs that enable Butler County residents to make wise decisions in the conservation of their natural resources (Butler SWCD, 2004). Its objectives include: 1) Assisting landowners in the implementation and execution of their individual conservation plans, 2) Providing funding and technical engineering to implement best management practices on the land, 3) Answering questions and making recommendations on improving or preserving natural resources, 4) Assisting developers, contractors, and engineers in the design and control of sediment during development, 5) Implementing and executing best management practices (BMPs) relating to construction sites and stormwater management, and 6) Providing information and education programs to the general public to raise awareness of natural resource conservation.

Some of the highlights of the office include engineering and funding of conservation practices through the Farm Bill, geotechnical reviews, stormwater plan reviews, inspections of commercial and residential developments, educational programs for students in grades K-12, and responses to homeowner/landowner complaints including concerns about drainage and stream bank stabilization. A few of the many services provided by Butler SWCD are

conservation planning and application assistance, no-till drill assistance, nutrient management plans, erosion control structures, treatment wetlands and livestock management facilities, and plan/plat reviews for subdivision and commercial sites. The office also sponsors information sessions and education programs such as newsletters, BMP publications, pond clinics, trainings for private sector engineers, an Erosion Control Field Day, teacher workshops, a Farm City tour, tree and ground cover sales, and more.

In 2004, Butler SWCD was able to provide conservation plans as well as construction drawings to 38 farmers for the creation of projects such as animal waste facilities, stream side fencing, aerobic lagoons, prairie grasses and more (Butler SWCD, 2004). The agriculture division designed, surveyed, flagged and assisted in the creation of 32,874 feet of grassed waterways for 26 landowners, and the office was able to convert 60 acres of farmland to native grasses, prairies, wetlands and forested buffers (Butler SWCD, 2004). With the assistance of NRCS programs, much of this land and these conservation projects are legally bound for 15-20 years.

On the urban side, Butler SWCD performed geotechnical reviews and plat reviews for 110 plats submitted through the Butler County Planning Department. The urban division also reviewed 16 Stormwater Pollution Prevention Plans and conducted over 150 inspections of erosion and sediment controls from construction sites in the county. In addition, they provided technical assistance to 60 homeowners with drainage, erosion, stream management, pond management, and other natural resource related issues on their land.

The education division was also able to conduct 43 programs to over 600 students in the county as well as provide numerous outreach services through the Ohio Environmental Education Fund and sponsor numerous annual events such as the Butler County Fair, Earth Day, and Waterfest. The urban and education personnel also were able to devote 20-30% of their time to implement key goals and write regulations for three of the six criteria goals spelled out in the Butler County Phase II Stormwater Plan.

II. NATURE OF POSITION

The urban program has always been the smallest division within the office, and it consists only of an Urban Specialist and Urban Technician who are responsible for providing technical reviews, compliance assistance, and resource management services for over 40 new developments each year. Although my position had been created the year prior to my employment, it had never been formalized in its scope or responsibilities, a fact that had become obvious to the District following the departure of the previous employee.

During my first week, I suggested that Jennifer Deaton, Urban Specialist, and Kevin Fall, District Administrator, sit down and fundamentally redefine the position to more adequately address the key concerns of Butler SWCD's urban program. During those meetings, we were able to set some key goals and objectives as well as choose some projects and job duties most suited to my experience and interests. The freedom to create my own agenda and expand the position to meet my knowledge, skills and abilities was the single greatest highlight of my employment. The following is a summary of those meetings with regards to my position (Butler APO, 2004):

Goal: To provide the Butler County urban community with technical oversight regarding soil and water conservation

Objectives:
1.) Increase awareness of water quality and its parameters
2.) Reduce non point source pollution in a watershed context by assisting and educating local developers, engineers, contractors, and government employees
3.) Reduce soil loss by monitoring erosion control practices and prompting the use of new BMPs where appropriate
4.) Provide technical assistance concerning the importance of erosion control and proper stormwater management.

The individual responsibilities are spelled out in the Butler County Annual Plan of Operations, which can be found in Appendix I.

From stakeholder input as well as the office's list of key concerns in the county (Appendix II), the District is keenly aware that erosion and sedimentation remains one of the most problematic natural resource concerns in the county. Land conversion and development pressures have only augmented this problem and begun to contribute to other water quality problems associated with urban runoff. I chose to make these water quality problems a central focus early in my employment, and the majority of my daily activities focused on reducing sediment runoff and better managing stormwater runoff within a watershed context.

The nature of my position entailed cooperation and coordination with several other governmental and private organizations intimately involved with similar problems. The most significant partnership that I had to form was with the Butler County Stormwater District (herby known as the 'Stormwater District'). The Stormwater District actually helps fund several of Butler SWCD's programs, including my position. It is a publicly-owned utility created under the auspices of Ohio EPA's Phase II program, and its central purpose is to implement the six minimum control measures and best management practices (BMPs) spelled out in the Butler County Stormwater Management Plan. Under a formal Memorandum of Understanding (MOU) with the Stormwater District signed within six weeks of my employment, I was able to help Butler SWCD assume a more proactive role in the Phase II program and help implement outstanding BMPs that the Stormwater District was unable to complete for lack of time and manpower. A great deal of my time was spent with the Stormwater District in managing construction site runoff, post-construction runoff, and education and outreach measures.

In addition to strengthening this partnership, I also aligned with other regional organizations committed to achieving comparable goals, and it demanded a positive working relationship. I worked extensively with the Butler County Engineers Office, Butler County Department of Planning, Hamilton County SWCD, the Ohio EPA, Ohio Department of Natural Resources (ODNR), the Mill Creek Watershed Council, the Miami Valley Conservancy District, the Friends of the Great Miami, the Hamilton-New Baltimore Ground Water Consortium, the Butler County Department of Environmental Services, and several municipalities such as the City of Monroe and St. Clair Township. After several months on the job, I also was invited to work with some larger state organizations such as the Water Management Association of Ohio (WAMO) and the Ohio Stormwater Taskforce as well as

seek membership as a Certified Professional in Erosion and Sediment Control (CPESC). Butler SWCD has always prided itself on its abilities to work with all types of people and organizations and it remains deeply committed to interdisciplinary teamwork in order to achieve not only its goals, but also the goals of other organizations committed to protecting the resources we all must share.

III. JOB DUTIES AND RESPONSIBILITIES

Plan Reviews

My primary responsibility throughout the internship was to provide technical review of all Stormwater Pollution Prevention Plans (SWPPP) submitted through the Butler County Department of Planning via Subdivision Regulations. These plans are required by the County for all residential and commercial sites over one (1) acre in size where the development is subdivided and eventually sold. The plans are required to meet minimum control measures for stormwater associated with construction activities. They are required to meet stipulations spelled out in both the Butler County Subdivision Regulations (Article VII) and the Ohio EPA's National Pollutant Discharge Elimination System (NPDES) General Permit for Stormwater Associated with Construction Activities (Ohio EPA Permit OHC000002).

Prior to my employment, SWPPP's were never formally reviewed as part of the Butler County subdivision review process. One of the early accomplishments during my internship was our offices ability to enact a 'Butler County Earth Moving Permit', where developers are required to pay a fee and submit stormwater and erosion control plans for our approval. The Permit enabled our office to be involved early in the planning and review process as well as become authorized to inspect sites during construction. The Permit also gave Butler County SWCD some enforcement power to hold up non-compliant sites from plat approval through the Butler County Department of Planning. More detailed information about the Butler County Earth Moving Permit can be found in Chapter VI of this report.

The purpose of an SWPPP is to delineate and demarcate the location of sediment control devices, describe existing site conditions, outline the timing of construction activities and provide specifications for the contractor. The overall goal of the plan should be to reduce sediment-laden runoff at the construction site before it causes off-site sediment pollution. An approved plan recognizes that erosion and sediment control is best accomplished with proper planning, installation and maintenance of controls. All of these items should be included in the SWPPP and can be revised during the review process. The actual reviews that I perform on all residential and commercial subdivisions involve the evaluation and assessment of all areas within the site as a function of the existing drainage pattern. Stormwater control devices and best management practices (BMPs) are different for areas with concentrated flow (e.g.

sediment/stormwater basins) versus sheet flow (e.g. silt fence or mulch berms) and for areas that need only basic runoff controls (e.g. check dams/slope drains/inlet protection).

To be approved by our office, the plan must meet all criteria spelled out in the SWPPP checklist which was given final approval by the Commissioners along with the Butler County Earth Moving Permit in January of 2005. This checklist is an inventory of basic requirements that are mandated in both the NPDES General Permit administered by the Ohio EPA and local requirements. I compiled these requirements and organized the checklist for the convenience of civil engineers and consultants who have always been in the dark as to what Butler County actually mandates in the erosion control plan.

Figure 3. Inspecting site with revised plans

My job with regards to these plans was to review each best management practice (BMP) to its specifications in the Rainwater and Land Development Manual. Best management practices (BMP) are defined as those management techniques that are most effective at preventing pollution from non point source runoff. Many sites require revisions or alternate BMPs, and construction cannot begin without approved plans.

During the plan review process, I also inventoried and assessed the soil and water resources present on the site. In most cases, I used the plan review process as an opportunity to perform an environmental site assessment where I made comments to the developer and design engineer concerning potential environmental impacts and the suggested steps to avoid or minimize those impacts. Often, sites with perennial or ephemeral streams and/or wetlands are required to obtain federal or state permits to impact those resources. I visited each site during the plan review process to identify such natural resources and made necessary recommendations. An example of plan review can be found in Appendix III.

Inspections

Once a plan has been accepted and construction activities commence, the urban division is responsible for inspecting all sites against their approved SWPPP. In the unincorporated areas of the county alone, there were 74 active sites under Butler County

Subdivision Regulations during my internship. The majority of these sites were residential or commercial subdivisions, and they existed in various stages from active construction to the post-recording stage. The spatial distribution of these sites for which our office holds responsibility and their current stage can be seen in Figure 4. (Note: Whole parcel industrial sites, whole parcel commercial sites and linear projects such as a roads and sewers are not mapped). From this distribution, it can be seen that the majority of the development in the county has been in the Upper Mill Creek and Gregory Creek Watersheds predominately located in West Chester and Liberty Townships, respectively.

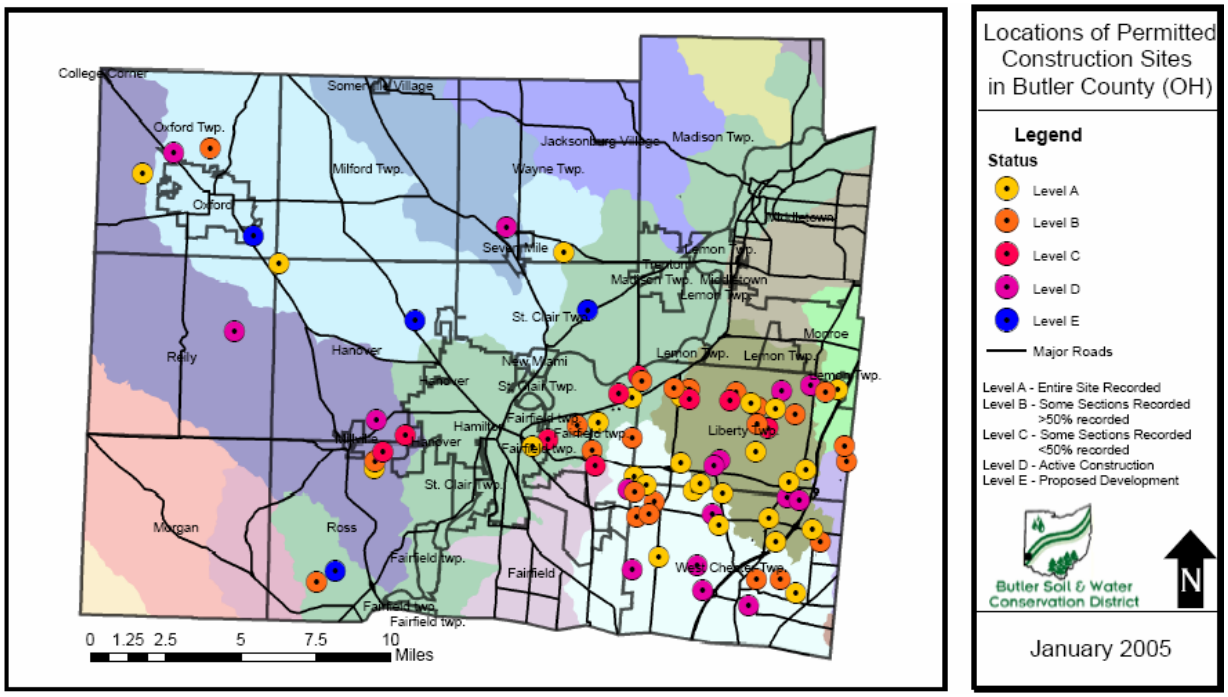

Figure 4. Spatial distribution of construction sites in Butler County's principle watersheds. These are only sites in the unincorporated areas of the county.

Violations are very common and require cooperation with the developer and contractors responsible for the project. For non-compliant sites, a notice of violation (NOV) is sent to the appropriate parties with a time frame for compliance. Follow-up inspections are necessary until a site achieves compliance. During my internship, I conducted over 60 of these inspections for the purpose of evaluating sediment and erosion controls. Roughly half of these inspections resulted in one or more notices of violation or an NOV-minor. An example of an NOV and an NOV-minor can be found in Appendix IV.

Inspections were primarily conducted with a representative from the contractor or excavator and frequently involved a meeting on site. Although SWPPP plans are approved before construction, contractors are responsible for the implementation of the individual controls and best management practices. In some instances, a developer sub-contracts an erosion control service provider to install and maintain erosion and sediment controls throughout development. In Butler County, one the main players in this growing field is LandCorp (Lebanon, OH).

A typical inspection involved characterizing and assessing the site, communicating the problems to the developer and engineer, and in most cases, educating all parties to prevent future problems. Most violations occurred as a result of errors in the timing of construction activities, negligence, and limited knowledge with regards to state and local rules governing earth-disturbing activities.

The most common violations were installing sheet flow controls, such as silt fence, in areas of concentrated flow (Figure 5) and failure to stabilize sites within the time frame spelled out in the SWPPP and mandated by both the Ohio EPA NPDES Permit as well as the Butler County Earth Moving Permit. Other violations frequently included failure to prevent off-site sediment tracking, failure to install sediment-settling devices (e.g. sediment basins), failure to modify post construction stormwater detention basins to collect sediment during construction, and failure to protect streams during construction (Figure 6)

Figure 5. Silt fence inappropriately placed across contour and in area of conc. flow

Figure 6. Silt trap serving as stream protection (Rentschler Estates)

Inspections are conducted at numerous times by the Butler SWCD. Sites are inspected before preliminary plat approval, multiple times during construction and before record

approval. Appendix V outlines the process that a development must go through in order to obtain record approval by the Butler SWCD (Appendix V). Following the recording process, sites are turned over to the Butler County Engineers Office (BCEO) inspectors. Their job is to inspect each individual sublot and common areas as homebuilders and/or subcontractors disturb the site that was stabilized and ultimately signed off by our office. The BCEO has the daunting task of inspecting some 4,000 sublots each year. Common problems they face are muddy roads, unseeded home sites, unprotected storm drain inlets and basin maintenance. This continues to be an area of erosion control that Butler SWCD and the BCEO seek to improve.

The importance of inspections to prevent off site discharges of sediment-laden water is imperative to protect local streams and receiving water quality within the watershed. Inspections are also conducted by the Ohio EPA and, in some cases, local watershed groups such as the Mill Creek Watershed Council. By combining efforts, every construction site in the county is inspected multiple times, and unlike many other counties in Ohio, very few sites go unnoticed. Nonetheless, the most valuable thing I learned from the inspection process is that every inspection and on-site meeting must absolutely be used as an educational opportunity, and the more that I was able to communicate to the developer and contractor following an inspection, the less likely that I encountered similar problems on other sites by those same individuals.

In most instances, developers and contractors want to achieve compliance, avoid hassles and be a good neighbor. In an effort to recognize those developers and contractors who cooperate and take extra measures to achieve compliance with erosion and sediment controls standards, I helped the Butler SWCD introduce the Super Soil Saver award. The monthly award is published in the Butler SWCD bi-annual urban newsletter, *Urban Developments*, and placed at the entrance of the award-winning site. The award helps convey a message of teamwork with the Butler SWCD and put some more vested interest as well as emotional value on compliance.

IV. PRINCIPLES OF STORMWATER MANGEMENT IN URBANIZED WATERSHEDS

Urbanization in all or parts of a given drainage basin brings about systematic changes in the overall watershed hydrology and receiving water quality. Urban hydrology is characterized by several distinct runoff patterns, and stream flow during both peak storm events and dry periods are markedly different than 'natural' runoff patterns for any given drainage basin. Largely influenced by the amount of impervious surfaces in the watershed and an increased runoff coefficient, urban hydrology is exemplified, and best managed, by understanding fundamental spatial patterns with regard to the magnitude of storm events. In addition, urban hydrology and its associated pollutant loads have direct and indirect impacts on receiving water quality and downstream habitats. Several essential principles of stormwater research were studied during my graduate curriculum, and they provided some of the key background concepts that I tried to apply during my internship to properly manage pre- and post-construction runoff. The practices to appropriately control both urban hydrology and protect receiving water quality during development are discussed in this section. The individual practices that I applied during my internship can be found in the next chapter.

Hydrology in Urban Landscapes

Development in an urban landscape changes how water naturally travels through a watershed. The most significant effect in this land use change is the dramatic increase in stormwater runoff as opposed to natural sources of storage. There are generally five significant hydrologic changes as a result of urbanization. These changes are a disruption of natural water balance, increased flood peaks, increased stormwater runoff, increased bankfull flows, decreased dry weather flows, and increased pollutant loads (Niemczynowicz, 1999).

The increase in runoff from urban areas has been well documented in the literature. Stormwater runoff from an urbanized basin tends to have a higher peak flow and a shorter time of concentration compared to a virgin or 'natural' basin (Braune and Wood, 1999). Figure 7 compares peak stormwater flow and

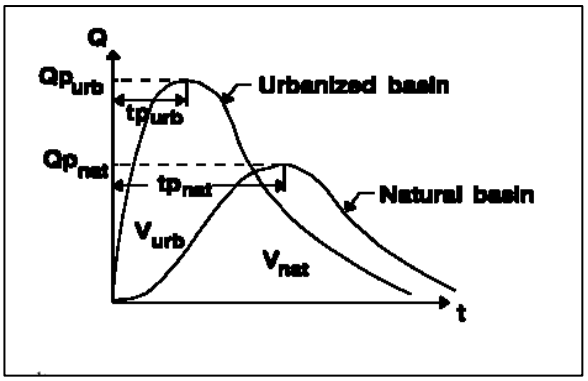

Figure 7. Time vs. Discharge (Q) for a natural basin as opposed to the same basin urbanized

time of concentration over time (Braune and Wood, 1999). As can be seen, basins with more vegetation are better able to infiltrate and store water, releasing it slowly over a greater period of time. This effect plays an important role in determining peak flows and the flashiness of floods, particularly on small scales (Konrad, 2003).

Most models of urban stormwater runoff are derived from the rational equation (Q=CIA) where C is runoff coefficient. The Butler County Engineers Office (BCEO) prefers a similar, yet more urban-specific model referred to as TR-55 (Technical Release-55, USDA Soil Conservation Service). In both applications, runoff coefficients, or curve numbers, are used to generate the percentage of runoff that can be expected when precipitation rates exceed the rate of infiltration (Gottschalk and Weingartner, 1998). While these calculations can be quite complex with regard to topography, soil type, climate, and geology; there is little doubt that urbanization increases the coefficient of runoff from urban dominated drainage basins. The following table illustrates the variability and complexity of stormwater runoff coefficients. In general, however, it can be seen that a larger runoff coefficient, and thus, a higher percentage of stormwater runoff occurs in urban areas.

	Hydrologic Soil Group			
Land Use, Crop, and Management	**A**	**B**	**C**	**D**
CULTIVATED, with crop rotations				
Row Crops, poor management	**.55**	**.65**	**.70**	**.75**
Row Crops, conservation mgmt	**.50**	**.55**	**.65**	**.70**
Small Grains, poor management	**.35**	**.40**	**.45**	**.50**
Small Grains, conservation mgmt	**.20**	**.22**	**.25**	**.30**
Meadow	**.30**	**.35**	**.40**	**.45**
PASTURE, permanent w/moderate grazing	**.10**	**.20**	**.25**	**.30**
WOODS, permanent, mature, no grazing	**.06**	**.13**	**.16**	**.20**
Urban residential				
30 percent of area impervious	**.30**	**.40**	**.45**	**.50**
70 percent of area impervious	**.50**	**.60**	**.70**	**.80**

Table 2 Runoff Coefficients for Selected Land Uses. Source: Purdue University, Agricultural and Biological Engineering website

Urbanization also has a distinct impact on stream channels, morphology, and fluvial geomorphology. Development along channels and floodplains alters the capacity of a channel

to convey water. Two of the most significant effects of such alteration are increased peak flows and increased stage height (Konrad, 2003). Stage heights are increased when the infrastructure along stream corridors and floodplains actually resist a streams ability to pass peak flows downstream. For instance, the construction of bridges and large buildings in the floodplain can cause regional backups and increase the stage height of floods.

The opposite effect can also be true during urbanization, with similar results passed further downstream. By channelizing water into storm sewers, concrete drainage ditches and other impervious surfaces, the traditional urban stormwater infrastructure promotes increased flow rates and velocities from urban centers to receiving streams (Konrad, 2003). The coefficient of friction in such stormwater infrastructure is lowered to .010-.012, and the resultant velocities of urban storm water to receiving streams can be increased by an order of magnitude (ODNR, 1996). This effect is most common in Butler County drainage systems.

Fluvial geomorphology, a relatively new and emerging field of study, suggests that all these effects drastically increase erosion rates downstream and promote stream bank degradation (Simon et al, 2000). Increased stormwater flows from urban areas can create incised stream corridors, permanently altering the stream (Simon et al, 2000). In fact, it has been estimated that up to 80% of the total sediment loads in streams, especially in loess areas, come from the eroded banks themselves (Simon et al, 2000). Urbanization only increases this estimate.

With regards to stormwater management, some of the most interesting research on urban hydrology relates to magnitude. From a strictly managerial standpoint, it appears that smaller peak flows from smaller storm events are more important than large annual peak flows from large storm events in an urbanized environment. Indeed, smaller floods from storm events are magnified in the urban setting while large floods remain relatively consistent (Konrad, 2003). This is true largely because storm events with low recurrence (< 75 yr RI's) are going to flood despite the land use type in the drainage basin (Konrad, 2003). Some research suggests that a 30% increase in basin impermeability results in a 10-fold increase in peak flows for the one, two, and four year floods while the 100-yr flood may not even be doubled (Howard and Smith, 1997).

When a drainage basin is subjected to urban land uses, the resultant annual increase in magnitude from small flood events are greater than for larger flood events. This relative

increase can be seen in Figure 8 where annual maximum discharge in Salt Creek (IL) has quadrupled (400ft^3/sec to 1200ft^3/sec) for the smallest 5% of annual peak flows on record (solid line) as opposed to only a doubling (~1000ft^3/sec to 2000ft^3/sec) for the largest 5% of annual peak flows on record (dotted line) as basin impermeability is increased over time (Konrad, 2003). Interestingly, Figure 8 further demonstrates how the smallest peak flows from this urbanized basin at the beginning of the new millennium is roughly equivalent to the largest peak floods observed in 1950 when the basin was largely undeveloped. The work validates the fact that flows from floods with less than 5 years recurrence show the greatest increase in discharge as basin impermeability is amplified over time (Konrad, 2003).

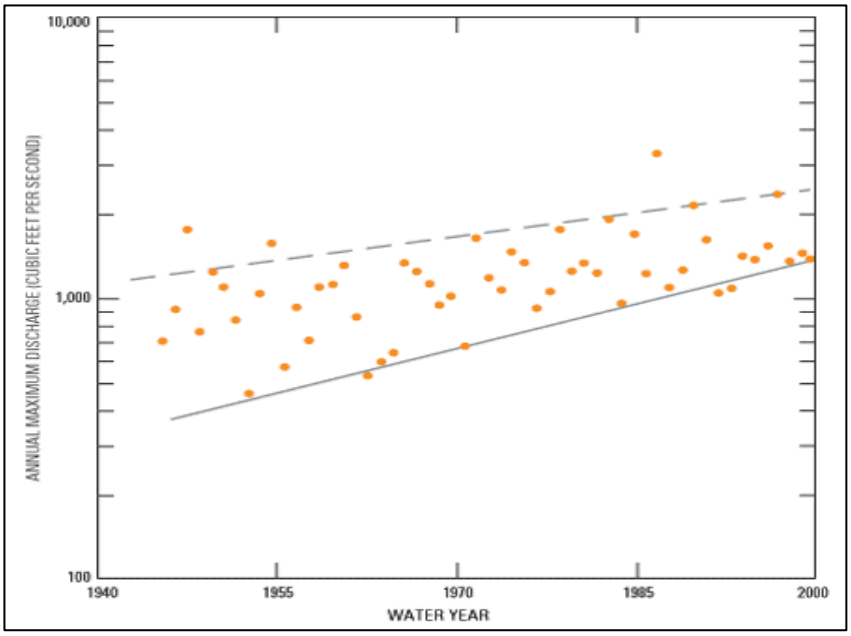

Figure 8. Increase in magnitude from small floods (solid line) as opposed to large floods (dashed line) as basin impermeability is increased over time. Note: Y-Scale is Logarithmic

Spatial Scales and Land Use Patterns in Urban Hydrology

Another interesting management concern deals with urbanized streams in certain land uses and at large versus small spatial scales. Throughout the literature, it has been shown that streams from smaller basins have greater variability in response to mean storm events (Douglas et al., 2000). This accounts for much of the flashiness seen at small spatial scales for any given land use type. Interestingly, some research has found evidence of upward trends in low flows at larger scales in the Midwest region and at smaller scales in the Ohio, north central and the upper Midwest regions (Douglas et. al, 2000). In essence, spatial scales

are critical to consider when apply proper stormwater management practices because resources should be geared towards smaller basins for mean annual storm events.

Land use type is another critical factor in applying adequate management practices for urban watersheds. Generally, single land use types have more predictable responses to storm events with regard to stream flow. For urban basins, these responses are generally correlated to greater stream flow discharges (Konrad, 2003). Specifically, a mostly urban, single land use dominated basin will have higher stream flows for the same storm event than a mixed land use (forested/residential/agriculture) basin of the same size, topography, and geology (Chui, 1997).

Thus, from a management standpoint, small storms in small urban-dominated landscapes are very important. Large storms will result in flooding despite the prevailing land uses, spatial scale, and management approach.

Antecedent Dry Weather Hydrology

The results of increased urbanization are two-fold. First, as shown, large amounts of extra runoff cause streams to have much higher flow rates, and the flows tend to increase much more rapidly during the storm and drop off more rapidly after the storm. However, due to the reduced infiltration volumes associated with impermeability, there is less water available to be released slowly into the stream over time, resulting in lower water levels between rainfall events. In essence, much of the water (and pollutants) that, under natural conditions, infiltrated into the ground and slowly found its way to nearby creeks now enters the stream all at once in an urban basin.

The effect of antecedent dry weather periods on the surface and sub-surface hydrology of urban landscapes is marked. The increase in impervious surfaces from urbanized basins reduces infiltration and groundwater recharge; thereby decreasing stream flow in times of drought (CWP, 2003). When throughflow (interflow) and baseflow are drastically lowered, higher order streams in urban settings can become intermittent and first order streams have the potential to dry up altogether (CWP, 2003). Furthermore, the intervals between storm events have been found to lower the mean low flow rates for urbanized basins, and more importantly; the antecedent dry weather periods have proven to increase the levels of

pollutants such as TSS and COD in adjacent watersheds even with comparable hydrologic variables (Chui, 1997). See Figure 9.

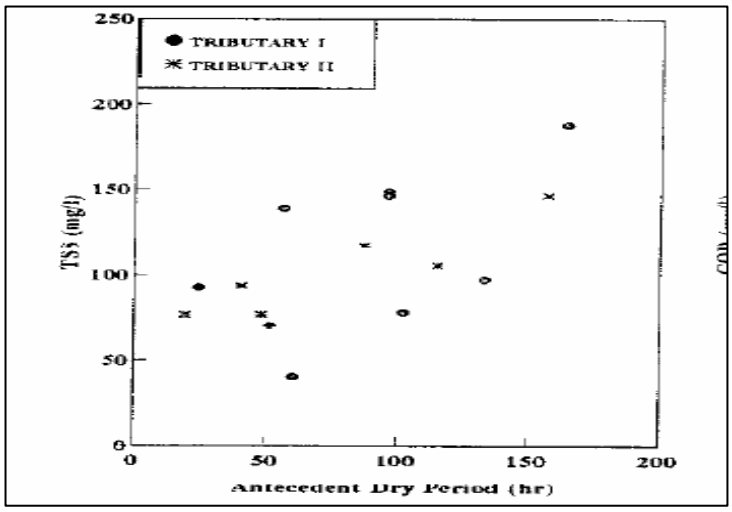

Figure 9. Increase in pollutant conc. as dry weather periods increase

The First Flush Phenomenon and Water Quality Patterns

This first flush phenomenon is generally defined as the initial period of stormwater runoff during which the concentration of pollutants is substantially higher than the later part of a storm event (Deletic, 1998). Understanding the first flush concept is critical in designing proper treatment systems, especially with the more stringent standards set forth in the Phase II Storm Water Program regulations pursuant the CWA. Certain types of pollutants such as sediment and total suspended solids (TSS), measured by conductivity, from urban runoff have been connected to the first flush (Lee, Bang, and Ketchum, 2002). Figure 10 illustrates this effect as per the research conducted by Lee, Bang and Ketchum in 2002. Pollutants from urban runoff can come from a multitude of parent sources including parking lots, rooftops, roadways, and all other impermeable and anthropogenic surfaces in urban areas; furthermore, the types of pollutants found in the first flush of urban runoff are some of the most

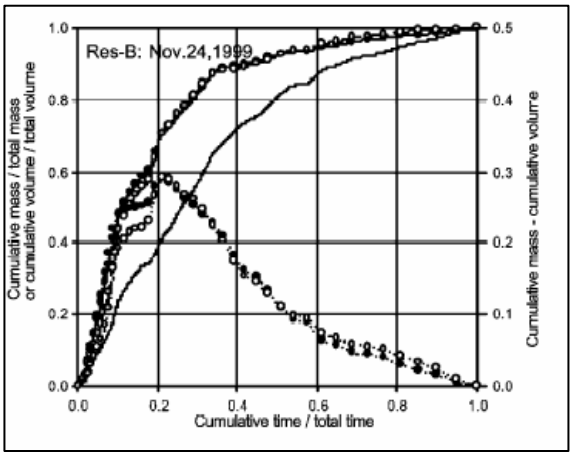

Figure 10. Example of First Flush measured for sediments (Lee, Bang, and Ketchum, 2002)

serious pollutants plaguing urban water quality today. These pollutants include heavy metals, organics, oils and greases, particulate matter from tires, sediment, PAH's, and many others (Lee, Bang and Ketchum, 2002).

The first flush phenomenon is difficult to predict, especially in larger watersheds. Some researchers suggest it occurs in the first 20 minutes, the first 20% of the total volume of the storm, or the first ½ inch of precipitation. Despite its known existence and proven patterns in certain applications, the first flush phenomenon is not the same for every drainage area nor can it be supposed from one basin to another. Testing the first flush requires studying individual basin parameters and associated pollutants, and the results are usually only justified by that basin. For instance, testing has been done to determine when the highest concentration of pollutants are mobilized in urban systems where combined sewage and overflows are a concern to not only water quality but human health (Gupta and Saul, 1996), but the presence of a first flush in such a study cannot be assumed to be analogous for adjacent basins, let alone basins in other hydrologic regions. The first flush is highly variable and largely a function of watershed area, rainfall intensity, permeability of urban surfaces, hydrologic gradients, and antecedent dry weather periods. In most studies, researchers have found sediment and conductivity to have the strongest first flush effects while other water quality parameters are less predictable (Deletic, 1998).

Source Control and Attenuation

In urban settings, the status quo with regards to urban stormwater management has been to get stormwater away from the site as fast as possible, and such a protocol is not foreign to Butler County or its municipalities. However, stormwater research and management regimes are beginning to show that this is not the best method to control stormwater. Research suggests that nature uses hydrological features such as wetlands and floodplains to store and attenuate runoff before reaching streams (Andoh and Declerck, 1998). Controlling stormwater at its source of deposition can more adequately imitate natural hydrologic features on the landscape and promote stormwater to be stored and slowly released. In hydrologic terms, this can minimize the impacts of floods and low flows in urban landscapes. In the literature, source control is a spatially distributed flow attenuation system where small volumes of "system storage" are used to slow the rate of runoff following rainfall (Andoh and

Declerck, 1998). In essence, the further upstream a control measure, the closer it is to its source and hence the better it simulates nature. While this practice is hydrologically and ecologically sound, it is best for pre-construction and pre-urbanization. Basins that have already been urbanized without regards to source control are difficult to manage in this sense, and fewer options exist to promote source control and attenuation in these environments.

Best Management Practices (BMPs)

The science behind urban hydrology has been well researched. However, the actual management and implementation of best management practices (BMP) to control urban hydrology and protect receiving water quality is equally or more important. As discussed, best management practices are most applicable and effective for small urban-dominated drainage areas (Konrad, 2003). Numerous types of BMP's have been encouraged and regulated by State agencies, and their efficiency to control urban runoff and protect receiving water quality is beginning to be researched (Mehler and Oskowski, 1999). The following tables list some of the more prominent structural and non-structural BMP's in stormwater management (Braune and Wood, 1999).

Structural Designs:	Non Structural Designs
• Stormwater Treatment Plant (Dallas,TX)	• Land Use Planning
• Retention Basins (concentrated flow)	• Wetland and Floodplain protection
• Detention Basins / Infiltration Basins	• Stormwater Protection Plan
• Diversion Ditches	• Pre Construction / Post Construction Plans
• Catch Basins / Check Dam	• Riparian Zone Buffers
• Porous Pavement	• Public Awareness
• Constructed Wetlands	• Increased regulation
• Oil / Water Separators	• Street Sweeping
• Rooftop Collection System	• Storm Drain Stenciling
• Infiltration ditches and grassy swales	• Vegetated Rooftops
• Silt fence and hay bales (sheetflow only)	

Table 3. Examples of Structural and Non-Structural BMPS in Stormwater Management

Selecting the most appropriate BMP for a given area takes a great deal of site-specific considerations and expertise. The literature suggests that selecting the most appropriate BMPs should include a "BMP Matrix" where pollutant removal efficiency, longevity of treatment device, applicability, climate suitability, maintenance, and comparative costs are all considered and ranked to make the best management decision (Tsihrintzis and Hamid, 1999).

Additionally, the research suggests that managers should be more concerned with storm events of higher frequency than with large recurrence intervals when implementing BMPs. For instance, Ohio EPA requires sediment basins to be $67ft^3$ per acre of upland drainage (NPDES General Stormwater Permit). This is specification is designed for the 2-yr 24-hour storm. In most settings, storms of greater intensity would likely outflow anyway and likely cause downstream flow increases.

For the most part, the science and technical information with regard to urban hydrology, receiving water quality, and stormwater management is abundant. Scientists and engineers know what the best management strategies are to control urban runoff and protect water quality. Managers of urban watersheds can use this information to make sound decisions. However, in most cases, the financial and political issues with regards to stormwater management, and environmental issues in general, are much more difficult to overcome than the technical issues.

V. FEDERAL PHASE II STORMWATER PROGRAM

Following a series of lawsuits against the federal government for its inability to meet 20-yr old federal water quality standards, namely the promise to make all US waters fishable and swimable by 1996, the US EPA enacted a Phase II stormwater program to target the impacts of non-point source runoff, or stormwater, from urban and agricultural areas in the United States. The program was innately conceived to address pollution sources throughout the entire watershed, and not just those sources extending from pipes (point sources) directly discharging to major rivers and streams. In the state of Ohio, the Ohio EPA has been delegated the authority to permit, monitor, and oversee the three main elements of the federal Phase II program. The three principle components of the Phase II programs are the industrial stormwater program, the construction stormwater program, and the municipal separate storm sewer system (MS4) program. All three require general permits for applicants to discharge stormwater from their site or jurisdictional boundary to waters of the State of Ohio. The construction and industrial general permits apply to individual landowners or developers who are responsible for obtaining coverage for their sites while the MS4 permit applies to communities, townships, or villages who discharge surface water runoff to waters of the State via separate storm sewers systems.

The original stormwater program was started in the early 1990s and applied to industrial facilities that met 1 of 10 categories, construction sties over 5 acres, and MS4 communities with populations over 100,000 as determined by the 1990 US Census (Ohio EPA, 2004). Beginning March of 2003, the criteria for coverage were tightened to include more industrial sites, smaller construction sites and many more municipalities. Table 4 highlights some of the major differences between Phase I and Phase II.

	Phase I (1992)	Phase II (2003)
Industrial Program	1 of 10 categories	Same + municipal industrial
Construction Program	All sites 5 acres or greater	All sites 1 acre or greater
Municipal Separate Storm Sewer (MS4) Program	Serving population of 100,000 or greater	Serving population of 10,000 or greater OR over 1,000 if they 'substantially contribute' to stormwater pollution

Table 4. Notable differences between Phase I and Phase II of the NPDES Stormwater Program

The role of local soil and water conservation districts, such as the Butler SWCD, in implementing and executing the basic components set forth by the Ohio EPA is undeniable. Local districts have always provided these kinds of services, especially the education and outreach components and the understanding of best management practices to control construction and agricultural runoff. The majority of Butler SWCD's Urban Division duties fall within the realm of managing the construction site stormwater program for residential and commercial sites in Butler County, and many of my standard duties, including plan reviews and inspections, fit within that part of the Phase II program. However, the most significant impacts to my position, the Butler SWCD and Butler County in general were in regards to the MS4 program.

Butler County Phase II MS4 Stormwater Program

On December 8, 1999 the US EPA promulgated regulations that required many cities, villages, townships, and counties within US Census Bureau "Urban Areas" to obtain a National Pollutant Discharge Elimination System (NPDES) General Permit which authorized communities with municipal separate storm sewer systems (MS4) to obtain coverage in order to discharge stormwater to waters of the State of Ohio. About 280 municipalities in Ohio were immediately affected with the possibility of another 200 local units of government by 2003. In Butler County, a total of 16 units of government had all or parts of their communities fall under Phase II population mandates while two additional units (City of Oxford and Oxford Twp) are due to face requirements in 2005. Those municipalities which had separate storm sewer systems were required to apply or join a Phase II program by March of 2003. The affected governments in Butler County, as determined by the 2000 US Census Bureau "Urban Areas" can be found in Figure 11.

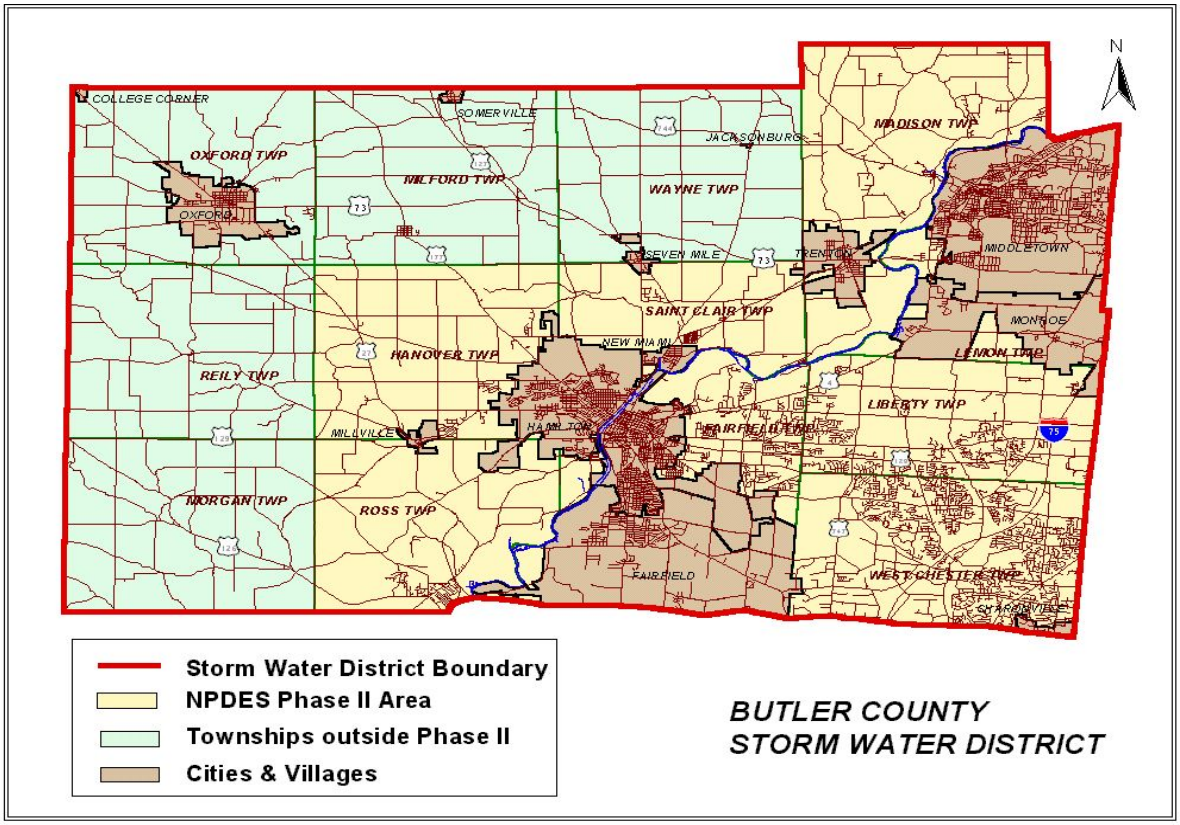

Figure 11. Urban Areas under the jurisdiction of the Butler County Stormwater District as determined by the US Census Bureau (2000)

All municipalities under the impending Phase II mandate were required to develop a stormwater management plan and program that met six minimum control measures to control runoff from their municipal separate storm sewer systems. The six minimum controls were:

1.) Public education and outreach

2.) Public involvement and participation

3.) Elimination of Illicit Discharges

4.) Construction site runoff control

5.) Post Construction runoff control

6.) Pollution Prevention / Good Housekeeping.

Since Butler County had a number of townships and small municipalities included in the Federal Register, it opted to form a countywide stormwater utility that remains one of the largest stormwater districts in the state. All of the affected townships and villages as well as the City of Trenton elected to obtain coverage under this NPDES General Permit (No.

1GQ00051*AG) held by the Butler County Regional Stormwater District via the Butler County Engineer. The cities of Middletown, Monroe, Hamilton and Fairfield opted to form their own programs; nonetheless, the Butler SWCD urban and education divisions provide invaluable support and services to all of the affected communities in implementing and executing the best management practices necessary to meet the six minimum components mentioned above. Although I spent time and conducted projects with these cities, the majority of my time was spent meeting goals set forth in the Butler County Stormwater Management Plan administered by the Stormwater District.

Butler County Regional Stormwater District

To address the NPDES Permit requirements, the Butler County Engineer proposed to the County Commissioners that a countywide stormwater study be initiated to evaluate the impact of proposed regulations on cities, villages and townships in the County. The County responded by hiring a consultant (FMSM) to organize the program and develop a stormwater management plan to meet the impending requirements. The work also included a plan to fund a Butler County Regional Stormwater District through a property tax based on the amount of impervious surface area. Thus, funds generated for the stormwater program were based on effective residential units, or ERUs, which amounted to roughly $13 for every 4,000 square feet of impervious surface area.

The Butler County Engineer and FMSM also formed a stakeholder committee made up of local government officials along with environmental and watershed groups and businesses and development organizations. The result of their work was a county-wide stormwater management plan that was submitted to the Ohio EPA for review, and more importantly, a selection of best management practices (BMPs) for each of the six minimum components that were to be conducted every year from 2003 to 2007 in order to meet goals and minimize the water quality impacts of urban stormwater runoff. An excerpt from the plan and the BMP Matrix can be found in Appendix VI. For the purposes of the Stormwater District and the Ohio EPA, best management practices (BMP) have been defined as those management techniques that are most effective at preventing pollution from non point source runoff.

After its formation, the Butler County Stormwater District organized a staff to oversee the key criteria goals and execute the individual best management practices. The most economical method was to divide the program amongst existing county agencies. The Butler SWCD was given the largest portion of the Phase II priorities, including all education and outreach (Goal #1), all public involvement and participation (Goal #2), the majority of the construction site runoff control (Goal #4), and some involvement in both post-construction runoff control (Goal #5) and pollution prevention (Goal #6). A Memorandum of Understanding (MOU) with the Stormwater District was signed early on in my employment so that our office could rightfully assume such a prominent role in the stormwater management program. In addition to the staff employed by the Butler County Stormwater District and the Butler County Engineers Office (BCEO), the remaining responsibilities were divided among the Butler County Health Department for illicit discharge detection, the Butler County Department of Environmental Services for pollution prevention, and the BCEO for post-construction runoff control. Although superficially it might appear as though these agencies had distinct responsibilities, the reality is that stormwater management is in the interests of numerous stakeholders, and Butler SWCD realized very early in the process that managing stormwater as a resource fits perfectly within their system of values and it overlaps with many of its other programs. This kind of overlap also exists between the six criteria goals and the missions of other county agencies, so it has been and continues to be in the interest of all parties to be involved in all six aspects.

VI. APPLICATIONS OF STORMWATER MANGEMENT – MANAGING STORMWATER AS A RESOURCE

My personal involvement in the Butler County Phase II program was broad and diverse. From technical guidance to educational outreach, I used my knowledge, skills, and abilities to impose stormwater management ideals on the general public and their decision making authorities as well as policy makers. Specifically, I advised decision makers in both the county and local municipalities on proper stormwater management practices. I organized a watershed project to incorporate several units of government. I took part in multiple education and outreach initiatives for adults and children. I initiated a new construction permit. I helped raise community awareness. I helped to rewrite certain portions of the county stormwater regulations as well as provide professional input on natural resource management issues to the planning department on their newest zoning code: a planned conservation development (PCD).

Phase II Education and Public Involvement Responsibilities

Storm Drain Labeling

My first contractual Phase II duty was to initiate a storm drain labeling program and to document the locations of the labels in a GIS. This BMP fell under the education and outreach section of the management plan and required 300 storm drains to be labeled by the end of 2004. Using labels and adhesive purchased by the Stormwater District and educational door hangers obtained from the University of Wisconsin Extension (UW-Ex), I found the names of several homeowner association groups and citizen groups such as the Boy Scouts and Environmental Action Alliance to do the actual installation. A total of 326 labels across 5 subdivisions in 5 townships were installed during my employment (Fig. 12).

Figure 12. Training volunteers from the Hughes Woods HOA to install storm drain labels

Although Butler SWCD provided the resources, the individual groups provided the actual labor, and in the process, they learned a great deal about protecting their local water quality from the types of contaminants (such as paint and yard clippings) that homeowners often unknowingly introduce into local waterways. The project also included a media campaign and newspaper articles to heighten public awareness and stimulate interest in the program (See Appendix VII). Drains were located and labels were marked using a personal geodatabase in our GIS system. A portion of the layer I created can be found in Figure 13.

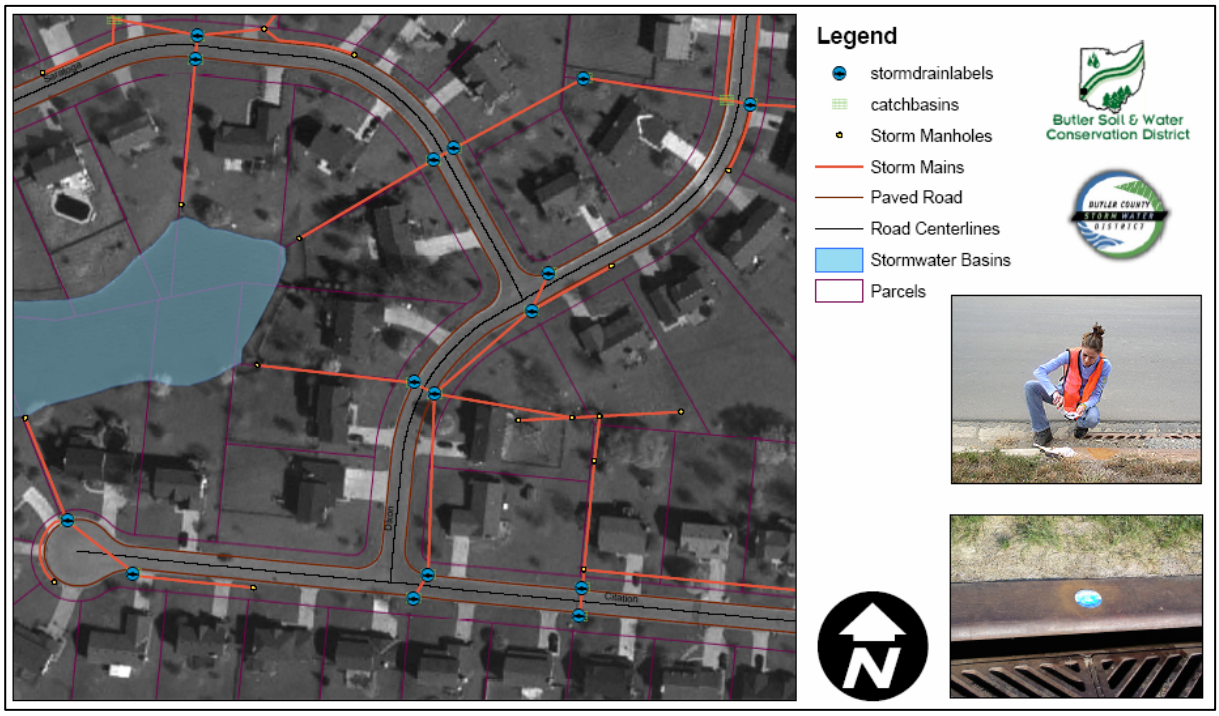

Figure 13. Storm Drain Labels Mapped in Butler County GIS System

Educational Stream Walks

Another education and outreach BMP that I helped organize was an educational streamwalk program for schools in the county. Streamwalks are excellent opportunities to introduce students to the all of the sciences that interact with each other in the dynamic setting that a stream provides. I used a model similar to the one employed by professors in Miami University's Western College Program; that is, I created an interdisciplinary approach to understanding the physical and biological properties of local streams. The program provided students with a wonderful outdoor learning experience and an insightful look into a number of scientific concepts and environmental conditions; furthermore, the program allowed those

concepts and the existing water quality issues to be brought to the forefront of students' minds through challenging, yet entertaining, educational streamwalks.

During my internship, I conducted three separate streamwalks, and all of them were performed with a different age group of kids in different watersheds with varying degrees of success. The streamwalks took place on Indian Creek with a Science Summer Camp from Ross Middle School, on Mill Creek in Keehner Park with a class from Cincinnati Aiken H.S, and on Elk Creek in Sebald Metropark with 8th graders from Madison Jr. High School. A copy of the outline for the Elk Creek Stream walk can be seen in Appendix VIII.

The walks consisted of interactive activities such as a fossil challenge, a stream flow exercise, kick seining for macroinvertebrates, fish shocking, and chemical testing. Students were introduced to concepts such as "What is a Watershed" and how to identify certain physical properties of the stream such as its floodplain, bankful width, pools vs riffles, and point bars vs. cut banks. In many cases, students were able to interact with streams for the first time in their life, and based on the evaluation of surveys from their teachers, the program was very successful. Figure 14 was taken during the streamwalk conducted on Indian Creek with students from Ross Middle School. In an effort to target sources of water quality impairment, the walks were also used to identify illicit discharges of waste. Also in compliance with minimum control measure #3 (Illicit Discharge Detection), basic dry weather screening was conducted with the students on pipes and outfalls which had distinct odor or color. These sources, usually outlet pipes from septic systems, were documented and referenced to the Butler County Health Department.

Figure 14. Demonstrating the concept of turbidity during a streamwalk on Indian Creek

Stream Clean-Ups

During my internship, I also helped create a stream clean-up program for the District. This program was again a Phase II stormwater management plan BMP that met public participation and involvement measures spelled out in the matrix. Stream cleanups are labor

intensive, yet simple best management practices (BMPs) to improve water quality in urban and suburban settings. Stream cleanups are an excellent method to allow local citizens a chance to see and experience their rivers and streams, while at the same time providing them with the opportunity to see the destruction and, ideally, police the impairment that a few of their peers are placing on overall water quality in their communities.

After developing the program and building a volunteer base, the first stream cleanup of my internship was conducted on a quarter mile stretch of Indian Creek just south of Millville, OH in Ross Township. This portion of Indian Creek was targeted after discovering a large amount of trash and other waste from the US 27 bridge in Millville. This portion of the stream receives runoff from several urban storm sewers as well as illegal dumping by local residents. The project was organized and managed by the Butler SWCD and the Stormwater District, but much of the actual physical labor was provided by Environmental Action Alliance of Oxford. Environmental Action Alliance is a volunteer activist organization comprised of students from Miami University who have keen interest in protecting local environmental resources.

During the clean-up volunteers collected five 55-gallon bags of trash, one 55 gallon bag of plastic recyclables, one 55 gallon bag of aluminum recyclables, over 200 pounds of scrap metal, a 10-ft long cable wire, three tires, one car battery, and over 50 lbs of dirty diapers!! The trash was properly disposed in waste receptacles at the Butler SWCD while members of Environmental Action Alliance took many of the recyclables back to Miami University's Recycling Center. Miami University has been recognized as a national award winner of "Recycle Mania" and in 2004, they were awarded the EPA Waste-Wise Partner of the Year (College/University) by the USEPA.

Figure 15. Members of Environmental Action Alliance clean up Indian Creek near Millville

Post Construction Stormwater Management

I also worked with the Butler County Engineers Office (BCEO) and the Stormwater District to tighten the post construction stormwater detention requirements in the county. Currently, Butler County requires that all commercial and residential developments must store the pre-developed 10-yr, 24-hr storm and have the capacity to hold back the post developed 50 yr storm from the same area. As outlined in the Chapter IV (Principles of Stormwater management), ideal stormwater management suggests that smaller is better when it comes to managing stormwater quality and quantity. Using the current form of regulations, it is nearly impossible to promote proper stormwater management through water quality BMPs when developers and engineers constantly choose to use this minimum design criterion.

I used my position with the county to influence the Stormwater District and the BCEO to tighten these regulations by drafting a new set of Stormwater Regulations; conveniently, the Butler County Stormwater Management Plan and BMP matrix also require that such an ordinance is enacted by 2007. The Butler SWCD urban division was able to meet with these agencies numerous times during my internship, and I never missed an opportunity to promote water quality by requiring such BMPs as stream setbacks or to inform them that that it is the smaller storm events that are magnified in the urban setting. Larger events like the 10yr to 100yr storms will likely result in flooding and property damage regardless of civil engineering. I was somewhat successful at presenting my message and convincing the engineers that holding back the increased flows from smaller events magnified by impervious surfaces (like subdivisions/commercial sites) at the source better protects downstream resources in addition to guarding against the major storms.

Our urban division also made it clear that with the rapid rate of land conversion in the county, homeowners along streams such as Panther Run are seeing increased velocity and more frequent flows at the bankful width, a mark usually designed for the 2 yr storm. Additionally, stormwater detention basins (or dry basins) in Butler County are channeling stormwater in and funneling the water straight out on every common event smaller than the 10-yr storm. Thus, I made a strong campaign and undertaking with the Stormwater District to get this regulation changed to more adequate levels such as the critical storm (~1 yr storm) or the 6-month 24-hr storm. I provided many models from other counties in Ohio and the information to justify the cause. Unfortunately, such a change would require basins to

become much larger and consume a larger area. Lobbyists from the Homebuilders Association (HBA) of Greater Cincinnati and the Ohio Valley Development Council (OVDC) have already petitioned a conservative group of Butler County Commissioners to avert such a change. Nonetheless, an agreement will be reached and ratified within the coming year to reduce the frequency storm requirement and begin to look at smaller events.

As of the date of this report, the new stormwater regulations, which I helped draft and review, will reduce the 10-yr storm requirement to the 2-yr pre-developed frequency event and leave open the possibility for developers to try experimental BMPs or treatment devices with regards to stormwater. Because the regulations are still waiting the approval of the Butler County Commissioners, they are not yet available to the public or included in this report. Early indications suggest that the regulations may need to be revised to fit within the Butler County Subdivision Regulations rather than becoming a separate bound document of 'Stormwater Regulations,' a motion that would upset both the Stormwater District and the Butler SWCD.

Another critical area that I helped to bring attention to was the fact that sites developed after 2003 should be required to not only store smaller storms, but treat those storms as well. This requirement is a small, but powerful section, authorized under the Ohio EPA NPDES General Permit (OHC000002) for Stormwater Discharges Associated with Construction Activity. Ironically, it is the same permit used to govern construction site sediment pollution in Ohio; however, there are measures stipulated in the permit that require sites to hold back a water quality volume (WQv) defined as the volume of runoff equivalent to the first 0.75 inches of rainfall. Similar to the first flush volume explained in Chapter 4 of this report, the WQv is supposed to be stored and treated on all Ohio developments after 2003. However, in most areas of Ohio, with the exception of NE Ohio, local stormwater requirements are in stark contrast with the WQv authorized under the auspices of this NPDES General Permit. Butler County is no exception. By only requiring that 10-yr storms are detained, it takes major modifications to treat a specified WQv. Riser pipes and modifications work during the construction process, but in post construction phases the BCEO does not want this volume of water pooling in their basins because of neighborhood complaints and myths about West Nile virus.

To combat this problem, I provided awareness of the problem to local engineers and developers and helped open the door to post construction BMPs such as water quality basins so that stormwater is not only stored but treated in properly designed stormwater collection facilities. I also took initiative to write grants as well as educate developers and engineers on the myths and benefits of extended detention and wetland extended detention. Many of these basins incorporate principles of wetland design and the water quality volume while conforming to the standards in Ohio's Rainwater and Land Development Manual. To bring even more awareness to this campaign, our office has already planned and sponsored a Water Quality Basin Workshop for local developers and engineers to learn these designs from professors, professional engineers and consultants. The event will take place shortly after the publication of this report.

Stormwater Management Presentations

In an effort to reach out to the private sector and actually influence the design and planning of commercial and residential development, I created a series of presentations that were given to local developers, engineers, planners, and contractors concerning stormwater management, the new ESC Permit, plan review requirements, Phase II water quality concerns, and even conservation design. Realizing that if I could get the actual designers to create sound stormwater management plans and protect natural resources in the design process, in some way our office would avoid many of the problems that often show up in the field such as piping streams, bulldozing wetlands, and failing to treat stormwater runoff. Further, with more viable erosion control plans, much of the accountability during times of violation would fall on the contractors failing to implement approved plans rather than the developer and their engineer.

The presentations were hour long sessions that focused on key issues in the design of SWPPP plans, protecting water quality, and managing natural resources. Since September 2004, four presentations have been given, including one at a banquet center in Fairfield where over 50 people were in attendance. The presentations were geared towards a more technical audience, and a great deal of time was spent answering many of their burning questions and duly noting a great deal of their frustrations. My experiences at the Ohio EPA and

background knowledge from my formal education provided a strong framework with which I was able to answer many of their concerns.

The majority of the presentation focused on how to create stormwater pollution prevention plans and erosion control plans. I provided the audience with information that I looked for during plan reviews and areas where I wanted to see improvements in the quality of plans submitted. Some of these areas of improvement included the protection of streams, wetlands and riparian buffer zones as well as engineering practices to improve post construction water quality. During the presentation I made sure to give adequate background information on topics such as sediment as a pollutant, overall water quality, and the permitting process with regards to streams and wetlands. Many of these developers and engineers were never trained on environmental issues like water quality and conservation of resources. They come from numerous backgrounds varying from business to structural design and civil engineering. It was also my belief and intention to use the presentations as an educational forum because most people, even professional minds, are convinced of change only if they understand why the change is necessary. Using this approach, I felt as though I was able to smooth over speculation that the local government was just trying to impose more regulation or drive up the cost of development; two concerns which have been expressed with regards to the Phase II program both nationally and locally.

I felt as though I gave the engineers a good deal of background information on the topics at hand. Two points, besides SWPPPs, that I really tried to emphasize were the fact that smaller storms are magnified in the urban setting and the overall importance of designing around resources like groundwater deposits, streams, wetlands and floodplains ahead of time using such methods such as setbacks or water quality treatment devices. I tried to demonstrate how both could be incorporated into the open space requirement in the county subdivision regulations. I also used the presentations as a forum to discuss several new topics such as potential changes in the stormwater regulations, changes in state legislation (H.B. 411) and the new Butler County Earth Moving Permit.

Perhaps the most beneficial result of the program has been the improvement in the quality of stormwater plans and erosion control plans. Many of the developers have given their engineers permission to explore alternative forms of best management practices, and our office has seen some improvement in the protection of resources such as floodplains and

streams. I also think developers and engineers are beginning to get a better grasp of the permitting process regarding streams and wetlands, and we are now beginning to receive calls ahead of time to perform biological surveys and assessments to see if a particular development may need a federal nationwide permit or water quality certification.

There will always be a gap between a developers perspective and the beliefs of a conservation district; however, these presentations were an attempt to get ahead of the game and convince developers that impending regulations will force everyone to look at these issues in the future and that designing around natural features is critical now, even if it means losing a few lots. Overall, the presentations were well received, and the District has encouraged the urban division to continue and even expand the program to audiences like construction site contractors and even township and city officials.

Changes in County Zoning Ordinance

Two of the newest zoning ordinances and land use plan changes in Butler County occurred during my internship and with the input of the Butler SWCD urban team. In an effort to promote smart growth, we helped introduce the latest zone changes in Butler County: a planned conservation development (PCD) and 35% open space requirement for all residential developments. One the toughest steps for a developer during the development process is a zone change (public) hearing and all the heated opposition on both sides of the plan. Using that as leverage, we helped the Butler County Department of Planning introduce a plan that lets developers forgo a zone change hearing on plats from agricultural districts (A1-A10) if they agree to create a PCD that conforms to the requests of all county reviewing agencies. Butler SWCD will be an integral part of this review team. We also helped increase the open space requirements from 25% to 35% on all residential districts and up to 50% on planned unit developments (PUD) and the PCD. These few, but necessary changes to the zoning ordinances are also required as part of the county stormwater management plan and Phase II matrix, and more changes should be coming in the future. It should be noted that the Butler County Director of Planning (Mike Juengling) and David Fehr were most cooperative in allowing the Butler SWCD to have maximum input in these changes, and they were instrumental in implementing these requirements which should be approved by the Commissioners by June of 2005. Both have received conservation awards by Butler SWCD.

VII. SPECIAL PROJECTS

Butler County SWCD Earth Moving Permit

One of the first special projects that I initiated with Butler SWCD was the implementation of an Earth Moving Permit. Article VII (Section 7.06) of the Butler County Subdivision Regulations (adopted in 1997) authorizes the county to administer a permit and review plans for erosion controls. For nearly nine years and reasons that remain mostly political, Butler County has failed to implement this requirement and formally review erosion control plans for stormwater associated with construction activities. In fact, members of the Butler SWCD were largely unaware of the possible financial benefits and control that a Permit could provide for the District. With budget cuts and financial difficulties across the state, a new permit provided an opportunity to help Butler SWCD fund its growing urban division, which until recently was not entirely financed by the County Commissioners or matched by state funds. Perhaps more important than the increased funds, the new Earth Moving Permit allowed our office to provide technical guidance and input on topics such as the location of erosion control devices and protection of resources within the formal review process administered by the Butler County Department of Planning.

The first step I took in developing the new Permit was to research what other counties were doing with regards to permits and seek input from stakeholders. Most counties that implement earth moving permits do so based on the size of disturbed area and the amount of man hours involved in plan/plat review, inspections, and site visits. Franklin County (OH) provided the best model with regards to fee structure, and after some modifications by our office, we had a fee structure and application that best suited our interests. The application itself consisted of a one page submission and fee based on the acreage of construction activities, but unlike many other counties, the granting of a Butler County Earth Moving Permit to a developer would be dependent upon the approval of an Erosion Control Plan (also known as a stormwater pollution prevention plan (SWPPP)) and a pre-construction meeting with the developer, engineer, and contractor/excavator prior to any earth disturbing activities.

The most challenging step in this project was to develop a set of baseline requirements which needed to be included on all approved stormwater plans. Using the requirements of the Ohio EPA's NPDES General Permit, I was able to derive a fairly simple, yet detailed

summary or checklist of items that all plans need for approval. A copy of these requirements and the permit itself can be found in Appendix IX, and after some negotiation with stakeholder groups, they were adopted by the Butler SWCD Board of Supervisors in November 2004. . In order to receive the actual Earth Moving Permit to begin construction, the developer or likely their engineer must submit construction drawings pursuant to these requirements for our office's formal review. Upon approval of the plan or its revisions, the developer must also schedule a pre-construction meeting with our office before starting construction.

The permit raised objections and endorsements from a number of stakeholder groups. Those in favor of the new permit included nearly all other county agencies such as the Butler County Engineers Office and Environmental Services who, until now, were responsible for reviewing those parts of the site improvement drawings. Those county agencies rarely were able to provide the appropriate time or technical assistance needed for erosion controls because roads, water, and sanitary sewers obviously held more importance in their time-shortened reviews. Watershed groups like the Friends of the Great Miami (FOGM) and the Mill Creek Watershed Council also expressed their approval for a more complete review of construction sites and greater control on development with regards to protection of natural resources.

However, a great deal of opposition also existed. The loudest voices were the Homebuilders Association (HBA) and one of its subsidiaries, the Ohio Valley Development Council (OVCD). These organizations viewed the permit as more stringent regulations and yet another fee placed on development as well as a further complication of the county permitting process. They made numerous phone calls and even showed up at some of our monthly Board meetings to express their opinions. I devoted a great deal of time and effort to incorporate as many of their comments into the checklist of requirements and the permit process as possible. I made numerous presentations to local engineers and developers to notify them of upcoming changes, and our staff even attended meetings at the HBA office and mailed out letters to the development community months ahead of time to solicit comments from these groups. By the time the permit was first implemented (January 2005), most of the opposition had subsided, and I felt as thought I had achieved some degree of success in

relaying the justification of fees and plan requirements as well as the existing county regulations to all stakeholder groups.

Memorandum of Understanding (MOU) with the Ohio EPA

With assistance from the District Administrator, Kevin Fall, I also completed the draft of a formal memorandum of understanding (MOU) with the Ohio Environmental Protection Agency. The Ohio EPA is the state agency delegated the responsibility of implementing the federal storm water program, including the National Pollutant Discharge Elimination System (NPDES) permit program. Discharges of storm water from sites where construction activity is being conducted, as deemed in 40 CFR 122.26, is authorized by the Ohio EPA under a general or individual NPDES storm water permit in compliance with the Clean Water Acts and provisions of the Federal Water Pollution Control Act, as amended (33 U.S.C. 1251 et. Seq.) and the Ohio Water Pollution Control Act (Ohio Revised Code Chapter 6111).

An MOU is a document providing a general description of the responsibilities that are to be assumed by two or more parties in their pursuit of a similar goal(s). Because conservation districts have not been given much authority to regulate state or federal legislation, MOUs are often adopted to allow Districts to assume some greater level of responsibility and to avoid unnecessary duplication of services. They are more commonly adopted among local units of government such as the MOU that exists between Butler SWCD and the Butler County Stormwater District to execute yearly goals. MOUs between local units of government and the state and federal government are much less common. However, I was able to draft an MOU with Ohio EPA that could potentially serve as a model for other local units of government across the state.

The need for an MOU with the Ohio EPA is actually quite simple. The Southwest District Office of the Ohio EPA has only one stormwater specialist (Chris Cotton) in charge of runoff from over 500 construction sites. The Butler SWCD staff has demonstrated the ability to review plans, conduct inspections and achieve compliance with developers and contractors. In order to alleviate workload and unnecessary duplication of services, the MOU serves as an agreement to let the Butler SWCD inspect the States' NPDES permit in conjunction with our own permit and to take corrective actions to fix noncompliant

construction sites. The MOU is strongly supported by all parties, and Butler SWCD is excited to hold more of an authoritative role in sediment and erosion control.

In essence, the MOU states that Ohio EPA and the Butler SWCD along with the Ohio Department of Natural Resources, Division of Soil and Water Conservation have agreed to establish a cooperative agreement for implementing a program to control soil erosion and sedimentation and to improve water quality from construction sites authorized to discharge storm water associated with construction activity under an Ohio EPA NPDES storm water permit. It is recognized that the quality of Ohio's water resources is of vital importance to all Ohioans, and that urban development can significantly impact water quality. An approach that is coordinated among these agencies will provide better oversight and technical assistance to those in the development and construction industry while decreasing unnecessary duplication.

With the establishment of an earth-moving permit with Butler County, the Butler SWCD demonstrated the ability to document and monitor stormwater discharges related to construction activity. Although Ohio EPA still assumes regulatory responsibility and enforcement, the MOU allows Butler SWCD to have authority to monitor and review construction activities that fall under Butler County Subdivision Regulations and the NPDES Permit.

As of the date of this report, the MOU is still waiting approval of the Ohio EPA, but it is expected to be signed by the Butler SWCD, the Chief of the Ohio EPA Division of Surface Water and the Chief of ODNR's Division of Soil and Water Conservation within the next few months. A copy of the specific MOU Draft can be found in Appendix X.

ESC Field Day

The Southwest Ohio Erosion and Sediment Control (ESC) Field Day is unique event that has been planned and conducted by soil and water conservation districts (SWCDs) in southwest Ohio. It remains a one-of-a-kind event consisting of a potpourri of indoor and outdoor demonstrations, speeches and seminars, product vending, regulations, and education surrounding topics related to stormwater runoff and erosion and sediment control. The goals of the field day are to increase awareness and promote all aspects of erosion control and related natural resource management issues to a diverse audience. The annual event is held

on the first week of June at the Warren County Career Center in Lebanon, OH, and it has grown exponentially since its inception in the summer of 2002. The event attracts vendors and sponsors from all over the Midwest who use demonstrations and booths to market many 'new-age' products such as compost logs, hydro seeding equipment, mechanical stormwater treatment devices, and many, many more erosion control products. The audience consists of diverse mixture of local developers, engineers, homebuilders, contractors, and government officials looking for the best methods to get their sites, clients, and communities in compliance with increasingly stringent non-point source pollution requirements.

In 2004, the event was attended by over 150 people; including 120 paid attendees. A copy of the brochure can be found in Appendix XI. It consisted of speakers in the morning, a lunch prepared by the WCCC culinary department, and demonstration field day events in the afternoon. The speakers included personnel from the Ohio EPA Southwest District Office Stormwater Division, a developer who gave his perspective of Phase II regulations, a stream specialist from the Ohio DNR, and an inspector who discussed what the problems look like from the opposite side of the audience. The afternoon session included outdoor demonstrations on hydro-seed and mulch, a tour of properly installed vs. failing BMPs, and even a silt fence race to demonstrate that perimeter controls can be quickly installed and effectively maintained. Figures 16 and 17 illustrate some sessions of the Field Day.

Figure 16. Field Day Presentation at WCCC

Figure 17. Demonstration of Erosion Control Matting

My role in this event expanded during my internship. For the 2004 event, I had just been hired and my role was primarily to obtain door prizes, register attendees, and oversee field day demonstrations during the actual event. After the event, I was responsible for

documenting survey responses and presenting those evaluations to the ESC Field Day committee. Towards the end of my internship I became actively involved in planning the 2005 event. I suggested, and the committee incorporated, many of the changes that our office saw fit based on past survey responses. I also took part in expanding the field day to include concurrent morning speakers as well as bring in an afternoon speaker and engineers to discuss ideals of conservation design. Basically, I have taken an active role within the committee to make the 2005 event more like a conference in the morning – where attendees can chose which talks to attend – and bigger and better afternoon session comprised of more field events, hands on demonstrations, and active participation.

The sky appears to be the limit when it comes to the future of the SW Ohio ESC Field Day. Many other conservation districts and local regulators have attended our monthly meetings in anticipation of holding such an event in their region or state. In only 2 years since its inception, the event has been attended by hundreds of people and it has generated a great deal of excitement amongst all stakeholders. The 2005 event, planned for June 7th is estimated to have a paid attendance of nearly 200 people – the largest of its kind in the state of Ohio. The event is an education and outreach opportunity of which I am truly proud to be involved. Other agencies represented on the ESC Field Day Committee include the Butler, Clermont, Hamilton, Madison, Montgomery, and Warren SWCDs; the Warren County Career Center, the Miami Conservancy District, and the Miami Valley Resource Conservation and Development Council.

Project SIGNs

Project SIGNS (Signage Inspires Great Neighborhood Streams) was a coalition of partners from across the Tri-State region, including the Butler County SWCD, whose mission was dedicated to improving water quality through increased awareness and stewardship of our local streams and rivers. The project was spearheaded by the Mill Creek Watershed Council (MCWC), who did a great deal of background research on the lack of knowledge that the general public had regarding even the simplest aspect of a stream—its name. The project was launched in September after nearly two years of planning, and its focus was to obtain funding and install signage on stream crossings throughout the Greater Cincinnati region. These signs were designed to identify the name of the stream being crossed and the watershed in which it

is located. Funding for over 130 local stream crossings were obtained and installed as part of the project.

My role in the project was to identify the best sites for stream crossings in Butler County and to spread the educational materials developed by the Project SIGNs team. With funding from the Stormwater District, Butler County was able to install 14 sets of stream crossing across the Phase II regulated communities and townships. I used the opportunity and my GIS skills to make a criteria ranking matrix for the proposed locations. Over 50 stream crossings were given consideration, but limitations and site conditions helped eliminate most sites and narrow the locations down to 20 feasible crossings of which 14 were chosen. The criteria limitations were: 1) signs could not be on state or federal roads, 2) they needed to be in high traffic areas, 3) at least one sign should be placed in each Phase II township excluding West Chester and Liberty, 4) signs should be spread across as many watersheds as possible, and 5) the signs must be installed by the Butler County Engineers Office using public right-of-ways. Using data from a traffic study conducted in 2003 and many map layers, I was able to identify 14 suitable locations. Their spatial distribution can be seen in the following figure.

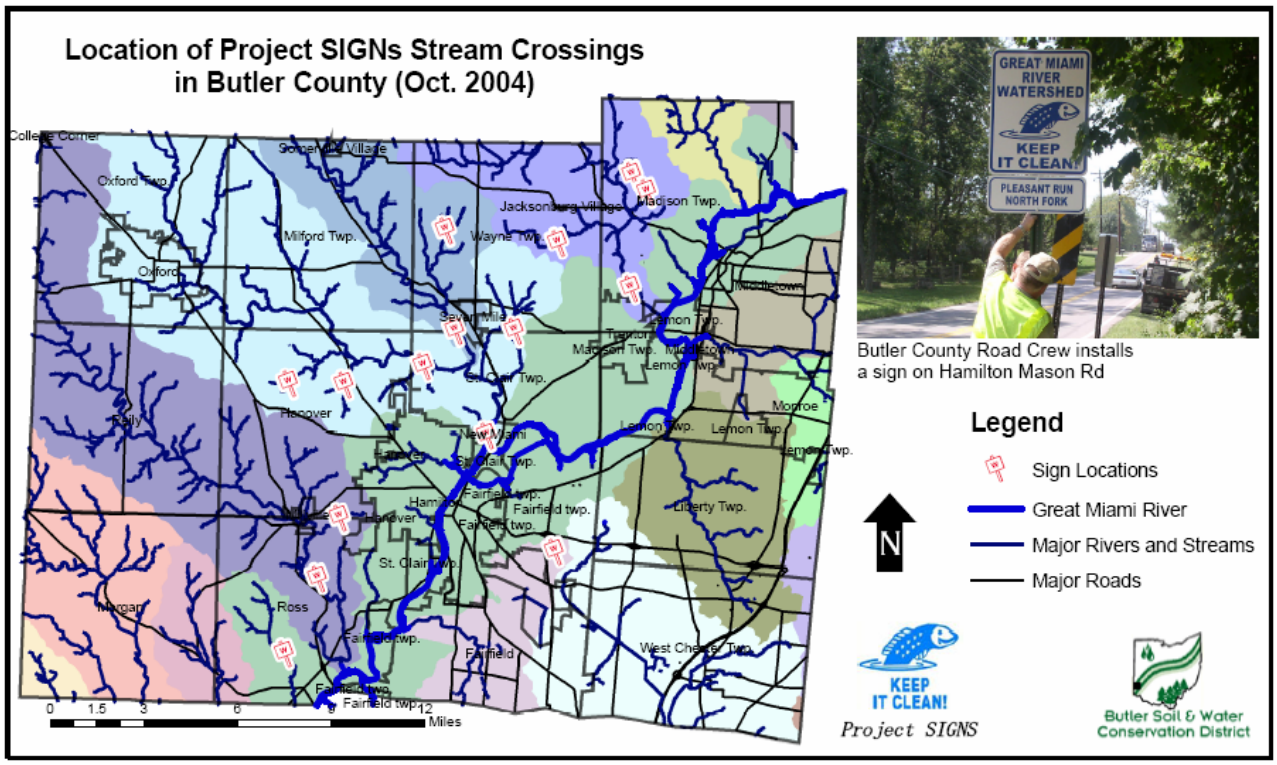

Figure 18. Location of Project SIGN Stream Crossings in Butler County

In addition to the watershed signage initiative, Project SIGNS team members, including myself, developed educational materials that explain how people can have a positive impact on local streams, rivers and lakes. Using grant money obtained by the MCWC, a school program as well as interactive displays and activities were created by the education committee which was co-chaired by members of our office. The money also supported educational flyers, static decals, and temporary tattoos for grade school children. In addition, Project SIGNs members also developed an operational website for local residents and other communities wishing to kick off similar projects as well as large scale media campaign with news releases, ads, and newspaper articles. All materials were spread across the tri-state region by the partner coalition. Perhaps the most impressive educational outreach tool was an educational ad shown during previews in local movie theatres teaching people to fertilize their lawns wisely. The ad ran for five weeks and reached over 700,000 people!

Project SIGNS team members were able to work with over 50 communities in the Greater Cincinnati area to install stream identification signs at over 130 well-traveled stream crossings. Waterways and watersheds included in the project were:

Ohio - Mill Creek, Little Miami River, East Fork, Great Miami River and Whitewater watersheds;

Kentucky - Banklick Creek, Gunpowder watershed;

Indiana - Tanner's Creek.

Project SIGNS partners and sponsors included the Banklick Creek Watershed Council, the East Fork Watershed Collaborative, the Little Miami River Partnership, Little Miami Incorporated, the Mill Creek Watershed Council, the Tanner's Creek Watershed Council; Greenacres Foundation; the Butler, Clermont, Dearborn, Hamilton & Warren County Soil and Water Conservation Districts; Butler & Hamilton County Storm Water Districts; Hamilton County Engineers Office; Hamilton County Environmental Services; Hamilton County Wet Weather Initiative; A&A Safety; & Cargill Incorporated.

Urban Newsletter

In an effort to promote water quality among the urban community, I helped publish the first ever urban newsletter, appropriately named *Urban Developments*. The newsletter was written for a target audience of developers, engineers, contractors, and builders. Although the type of urban development in Butler County varies greatly, the target audience represented nearly 100% of the urban 'clients' that we deal with on a day-to-day basis. For the most part, these individuals and businesses know little about the benefits of water quality or how to properly manage resources on their site. To the extent necessitated by law, the engineers and consultants generally have a grasp of the regulations surrounding resources during development, but only a few have strong connection or understanding of the principles behind those regulations.

The goal of the urban newsletter was to bring attention to hot topics surrounding development with regards to water quality, resource protection and/or erosion and sediment control. The publication was exceptionally well received as the first ever issue focused on the most commonly asked question that I received during my internship: "What is a Stream?" While most of the target audience sought to hear a simple answer, such as a blue line on a USGS map, I elaborated on the topic by detailing the importance of all types of streams and outlined the steps that developments should take to appropriately answer this question. A copy of the actual publication, sent to over 200 offices in SW Ohio, can be found in Appendix XII.

The newsletter also provided an opportunity to relay significant dates and upcoming workshops that might be of interest to the development community. Included in the newsletter were times and dates for the Water Quality Basin Workshop and the Erosion and Sediment Control Field Day. Both are examples of events that are co-sponsored by our office and actively planned by the Butler SWCD urban division. We also use the newsletter to acknowledge the site which best controls sediment and manages stormwater runoff. By commemorating a different site each month with our Super Soil Saver (S^3) award, we hoped to recognize the developer, contractor, and engineer who all helped to make compliance achievable at that particular site. The first award was given to the Sanctuary Development located off Kyle's Station Road in Liberty Twp. The award has been positively discussed in

small circles within the urban community and has even brought some comradery between contractors and excavators in the field.

The most challenging part of the newsletter was drafting it in a way that the reader would want to scan the entire document. In order to effectively get our message across, it was written in an upbeat tone and worded as if an engineer or developer had written it. The publication has received encouragement from several engineers, contractors, developers and even government officials not necessarily trained in areas of resource management, but certainly who benefit from the increased knowledge. Future publications will deal with topics such as wetland delineation and protection, post construction water quality BMPs, and phase II stormwater changes.

Grants

The internship with Butler County SWCD provided me with an opportunity to work with several grants and gain experience writing grants to support projects and programs that our Butler SWCD actively purses. The Grants that I worked with during my employment included a $20,000 grant with the Mill Creek Watershed Council (MCWC) to install stream signage with the aforementioned regional coalition, Project SIGNs, and a $5,000 OEEF grant from the Ohio EPA Office of Environmental Education (OEEF) to provide educational materials to children. Working under the auspices of both grants, I was able to better understand the processes involving grants, including grant agreements and progress reporting.

Towards the end of my internship, I wrote a grant proposal for the Butler SWCD to obtain a Five Star Restoration Grant. Five Star grants are administered by the US Fish and Wildlife Foundation, the National Association of Counties (NACO), the Wildlife Habitat Council, the USEPA, and NOAA. The Five Star Restoration Program provides modest financial assistance on a competitive basis to support community-based wetland, riparian, and coastal habitat restoration projects that build diverse partnerships and foster local natural resource stewardship through education, outreach and training activities. The grant requires a partnership of at least five other agencies interested in resolving or restoring a similar environmental problem, and grants are awarded by matching the amount of funds and in-kind services that each of the Five Star partners can commit. In 2004, 50 projects received grants of an average $10,000 out of approximately 180 applications received.

During one of our urban division staff meetings, we decided that a great idea for such a grant would be to modify an existing stormwater detention basin to meet the needs of the new Phase II NPDES permit requirements of a WQv, or water quality volume. This is essentially the first 0.75-in of a rain event which carries the majority of the pollutant load (especially sediment and metals) and must be detained for 24-48hrs according to the NPDES General Permit for Stormwater Associated with Construction Activities (OHR000002). Unfortunately, the EPA along with our office and the BCEO have been weak at requiring this stipulation during the review process. The grant that I proposed was to create one of these modern 'water quality basins' and use the matching funds to buy monitoring equipment, collect data, and use the results to teach developers and engineers the positives and negatives of such alternatives BMPs. A secondary benefit to me personally would be to use the results to share with other researchers and publish my results on this topic which has yet to be formally studied in the literature.

The grant required a partnership of at least 5 agencies with matching or in-kind donations. For the purposes of the proposal, I used commitments from several other organizations, but I desperately needed the BCEO and the Stormwater District to partner on this grant. They continue to have serious long-term management fears and liability concerns which prompted them to give a very hesitant verbal commitment.

In the past, the average grant is $10,000 but can go up to a maximum of $20,000. I have contacted the Five Star reviewers, who have never had such a proposal and like uniqueness. Preliminarily, our office has been told that this is an excellent idea. But we have to sell the grant as restoration rather than just meeting a federal law with federal grant money. Such actions are usually denied. An excerpt of the grant proposal summary is below.

> Butler County (OH) will restore 420 feet of riparian corridor in a rapidly developing suburban watershed, replacing the existing barren and concrete-lined stormwater detention facility with a fully functioning 1.1-acre wetland to treat stormwater runoff and provide upland riparian habitat. The project will consist of two parts. First, the existing detention basin will be modified and restored to a wetland extended basin, ideally to provide water quality treatment of residential runoff before entering Mill Creek. Second, a monitoring program will be enacted by the partners to evaluate water quality entering the stream after storm events. Serving as a natural method to treat non-point source runoff, the project will also provide a local example of the type of riverine environment that once existed in Mill Creek Watershed before urban land uses dominated the landscape. The results of a water quality monitoring program will be an invaluable data source used to educate local developers and engineers on this type of alternative best management practice (BMP) to mange stormwater from their sites. Project partners include the Butler SWCD, Butler County

Stormwater District, Beckett Crossing Ridge HOA, Ohio Dept of Natural Resources, the Mill Creek Watershed Council, and Miami (OH) University.

GIS Projects

Perhaps the most appreciated contribution of my internship with respect to the Butler SWCD was the integration of an in-house Geographical Information System (GIS); fully capable of processing numerous data layers and accessing hundreds of geospatial databases that previously only existed as hard copy maps or raw data tables. Without any IT or computer resource people in such a small office and an overworked GIS staff of two in the downtown Administration Building, my background and experience with GIS at Miami earned me major role in the purchase and implementation of ESRIs® ArcView™ 9.0 GIS software. The only problem was that none of the other staff had any GIS experience. Nonetheless, the staff eagerly awaited the opportunity to get the software and utilize it to alleviate their individual workloads.

Within a few weeks of my hiring, I instantly realized the invaluable opportunities that GIS could provide all divisions within our office. With a young, computer savy staff, the timing for purchasing GIS software could not have been any better. In August of 2004, the Board of Supervisors unanimously approved a motion by the District Administrator to buy two licenses through Butler County Information Services (BCIS), and it was finally released to the staff for use in December. The incorporation of this mapping software has already revolutionized the way Butler SWCD carries out its daily mission, and it will play a critical role in achieving long range goals, specifically because it can answer questions and process data that previously did not exist or required expensive government consultation.

Prior to my arrival in Butler County, many of the staff's daily job duties and information sources were accessed using older, sometimes even outdated, methodologies. For instance, the agriculture engineering division within Butler SWCD inherently needs basic data to compliment their surveying measurements and complete conservation projects like grassed waterways. The starting mark for such a project has always been to identify the watershed area draining to the point of design, and ultimately determine the amount of runoff expected at that design point. The method also requires soils classification onsite for given storm duration –usually a 10yr-24hr. The staff has traditionally photocopied USGS topo maps (10-ft contours) and calculated the watershed area with a planimeter. They would have to

photocopy 20-yr old soil surveys to the right scale and use drafting techniques to find parcel dimensions and correctly overlay the contour and soils. The process could take hours to do well. With upgraded GIS data and minimal training, staff can now access more accurate 2-ft contours, quickly overlay soils information and digitize watersheds that give more precise acreages in a fraction of the time.

One of the first steps I took after installing the software was to build a common database for all staff to easily access and use. The actual spatial data were obtained from a number of sources. Some of the largest shapefiles came from the County Auditor, such as parcels, while the vast majority of individual layers, such as 2-ft contours and ortho-photographs, were imported from the BCIS's ArcSDE database. The engineer's office (BCEO) provided valuable urban data such as storm sewers and impervious parcels. By mapping servers with permission, building County partnerships, and coordinating with other County agencies possessing large amounts of geospatial data, we were able to create a massive reservoir of data. A great deal of time was also devoted to obtaining useful office-specific data such as rectified USGS Quads, watershed boundaries, Digital Elevation Models (DEMs), FEMA maps, and the National Wetland Inventory. Much of this data was downloaded for no cost off the internet from credible sources such as the Ohio Dept. of Natural Resources, although it did require some projection transformation. The data were then stored on a local server and exist in a variety of forms but mostly as shapefiles, coverages, and user-friendly personal geodatabases that organize all kinds of individual feature classes.

After building the in-house database, I had to train the rest of the staff to perform basic operations and build an understanding of the software. One of the most beneficial uses of the software for everyone was using the system to find parcels of landowners (or development sites) and overlay every bit of geographical data available for that area such as floodplains, soils, roads, zoning and land use, principle watersheds, contours, aerial photos (past and present), sewers, storm sewers, municipal boundaries, section/town/range, ponds, and even abandoned mines. The system was used to calculate acreages, create new features, buffer distances of those features, download GPS locations, make worker-specific projects, and create models to simulate natural conditions.

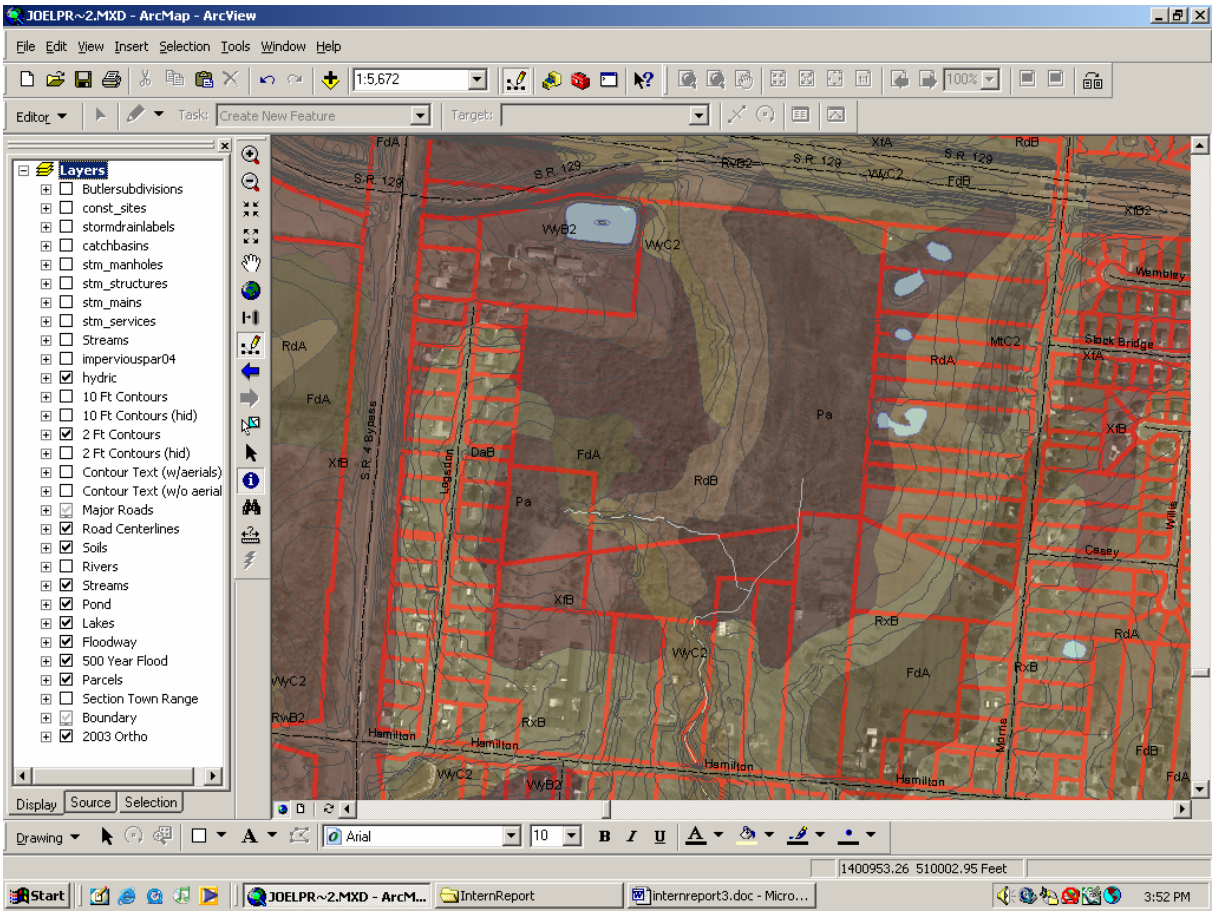

Figure 19. Example layers used in plan review

My job and the urban division particularly benefited from GIS projects. Many of the daily assessments including storm water pollution prevention plan reviews, geotechnical evaluations, site investigations, and plat reviews are completed much quicker with much more site specific comments (see Figure 19). The urban division has also created a great deal of its own data including mapping active construction sites and identifying proposed developments. A great deal of success was also achieved incorporating GIS into stormwater management and the Phase II Stormwater Programs. In fact, one of my biggest projects was building a personal geodatabase called 'Stormwater' that could be used by all county offices given responsibility for providing deliverables by the Stormwater District. The 'Stormwater' personal geodatabase is comprised of six class layers representing each of the six minimum control measures auspicated by the EPA. Each class layer is represented by appropriate feature classes. In the 'Public Education' feature class there are layers representing Butler County surface waters, streams, wetlands, and watersheds; in the 'Public Outreach' feature

class there are layers with storm drain labels as well as Project SIGNs locations; in the 'Illicit Discharge' feature class there will be a layer with buffers to streams from septic systems that are identified to be failing; in the 'Construction' feature class, there layers are layers with all known construction sites and 50-ft buffers of those sites with respect to large waterbodies; in the 'Post-Construction' feature class, there are storm sewers, impervious surfaces, catch basins, and storm mains; and in the 'Pollution Prevention' feature class, all municipal storage facilities will be identified with demarcations for those which have received training from the Stormwater District.

Natural resources such as streams, wetlands, groundwater deposits, and floodplains are better protected as a result of more appropriate planning by the Butler SWCD through its GIS system. By the end of my internship, Butler SWCD had even been consulted by the Butler County GIS Dept to do natural-resource related projects that benefit not only our office, but provides useful data to other county agencies while alleviating the overall workload within the County offices. Butler SWCD specifically helped the Butler County GIS Department by integrating applicable data found off the internet and conjuring up new approaches for using existing data to solve problems and identify resources important to the Butler SWCD. The following is an example of one of our extramural GIS projects for the County.

> Butler SWCD will update all named streams in the county for the Butler County GIS Department and other agencies interested in this information, most notably the BCDES and the Stormwater District. The existing layer consists of 'dumb data' or fragmented lines digitized from other software programs. The layer desperately needs to be assigned text values in at least two new attributes called 'Name' and 'Principle_ Watershed'. Butler SWCD will edit the current feature class by adding the nomenclature fields and modifying each individual segment of each individual known stream.
>
> Members of the Butler SWCD have already done such a project using other line layers (contours to make Digital Elevation Models). Individual stream names will be obtained from numerous credible sources such as 7.5' USGS Quadrangles, the Butler County Soil Survey, and historical maps. Our office has already obtained all 12 quadrangles from the USGS in digital format and converted them to the correct geographic coordinate system used by the Butler County GIS Department. Principle watershed names will be obtained from data that our office has obtained and edited from the ODNR. Again, this data has been re-projected to the correct coordinate system, making it extremely useful in this project.
>
> This project will be completed within 18 months of reaching an agreement with the Butler County GIS Department. It is estimated that the project will take approximately 250 man-hours to complete over the aforementioned time frame.
>
> Butler SWCD has a vested interest in this project for numerous reasons. First and foremost, it helps bring awareness to streams. Second, the data is useful by a potentially broad group of stakeholders, including watershed groups, schools, researchers, farmers, landowners, state and federal resource managers, etc... Perhaps more than any other reason, Butler SWCD wants to have named streams in digital format for consultants, engineers, and developers who

> may come to Butler County for data needed in site development. Our past experiences indicate that named streams are given extra precaution and protection during development, and our office is in the business of protecting resources.

GIS software is inherently intended for geographers, social sciences, the physical/analytical and biological sciences, and even national defense. But its uses can be seen in the modern business world and expanding exponentially in other sectors such as transportation. Butler SWCD rode this wave at the right time as the learning curve has been shortened. The absolute best way use the system is to start a project by asking a question which the local GIS can help answer. In the future, I will help ensure that Butler SWCD moves from strictly a user mode to more of a creator/editor of geospatial data. By doing this and finding more creative applications, Butler SWCD will start to be able to answer some critical questions to help it meet future goals. Specifically, the District should be able to start asking 'Where are the best places for a conservation practice?' or 'How does a particular project influence the receiving stream?' These previously unanswerable questions will now be more feasible by using the data to meet basic matrix criteria and incorporate creative applications of the software.

VIII. CONCLUSION

The principles and applications described in this report should be used as a reference to students and professionals in such interconnected fields as stormwater management, erosion and sediment control, and water resource conservation. As demonstrated, the underlying premise of this internship was to reduce non point source pollution from urbanizing watersheds in Butler County. The actual job duties performed and projects that were undertaken during this internship were done so to achieve this vision and related objectives that provide the Butler County urban community with technical assistance and oversight on issues related to soil and water conservation. Although progress was documented, a great deal of work remains.

To best fulfill goals in the long run, stormwater and its receiving streams must be viewed and managed with the same integrity as other valued water resources like groundwater, wetlands, or floodplains. Only then, by actually managing stormwater as a resource, will the most significant source of non point source pollution in urbanizing watersheds be reduced. This approach has most scientists, engineers, and professional resource managers convinced that better attenuation of stormwater at its source combined with biological and structural treatment of runoff are the most effective methods to protect receiving water quality. However, political, financial and economic boundaries are always real limitations to ideal resource management. The local initiatives described in this report were intended to promote conservation in urban watersheds while utilizing sound best management practices (BMPs) across these natural and geopolitical boundaries.

Concluding Thoughts and Remarks

Overall, the internship with Butler SWCD was challenging and rewarding; enabling me to obtain a greater appreciation for the need and complexity of conservation work in both agricultural and urban settings. The single most outstanding benefit of my internship was that I was given the freedom to set my own course for how to accomplish individual and District goals while using my knowledge, skills, and abilities to make a difference at both the political and grassroots levels of conservation in Butler County. Combining my technical and sometimes academic background with an ability to communicate with people, I feel that I became an effective resource manager, and educator, at both extremes. From giving formal presentations to professional engineers, to advising the Butler County Department of Planning, to conducting streamwalks with middle school students; I was able to communicate and coordinate ideals of water resource management to different groups with oftentimes different agendas.

As a new employee, I worked diligently to demonstrate to my peers that I was competent as well as efficient in completing tasks. I also tried to think 'outside the box' and provide the District with new or alternative paths to address age-old problems and framework for resolving new ones. As a result, I think others viewed me as an asset and even credible resource.

The internship also taught me a great deal about the functionality of local government in addressing environmental problems. Previous employment with the Ohio EPA and even at Miami University never taught me the importance of local planning, education and technical assistance in resolving many of the problems that I eventually encountered. Many state mandates and federal regulations governing these problems are weakened unless local governmental ordinances are consistent and its employees possess the capacity to implement all three. This is especially true when state and federal budgets are cut and personnel are stretched thin. Local units of government are better structured to provide eyes in the field and ensure that conservation is implemented on the land.

Above all, however, the most important thing that I learned with respect to water resource management was that political and financial constraints often dominate the technical or scientific information available. The Phase II Stormwater Programs was the most obvious example. Incorporating policy changes or changing regulations require public hearings and

the approval of County Commissioners who are often influenced by powerful stakeholders groups such as the Homebuilders Association and the Ohio Valley Development Council. As a result, the role of my position and the Butler SWCD often fell to educating those parties at the grassroots level or pursuing other avenues such as workshops or field days that promote messages of conservation in an alternate forum. Furthermore, the greatest outcomes that I saw during my internship were not necessarily from measurable enhancements of water quality, but from the positive working relationship that all Butler SWCD's programs demanded. As I found in many of the projects that I worked on, but specifically with respect to the Phase II Stormwater Management Program; the fact that Butler SWCD is now able to sit at the same table as other, more powerful County agencies is a victory. Our presence forces all entities to combine resources and work together to accomplish goals and objectives that may not have previously existed.

In all, I am pleased with my internship experience and humbled by the progress that Butler SWCD has taken with its youthful and energized staff. There are a number of steps yet to be taken, but I am confident that my internship has helped the District pursue a path that will ensure they become a leader in Southwest Ohio, especially in terms of urban erosion control and stormwater management.

IES Preparation for the Internship Experience

The Institute of Environmental Sciences (IES) core curriculum, public service project, and courses taken in the 'Water Resource' area of concentration helped prepare me to actively contribute and participate in all facets of the internship experience. The classes that proved extremely useful were Surface Hydrology, Advanced Geographic Information Systems (GIS), Watershed Management, and Regional Land Use Capability Analysis. While the courses in my area of concentration proved most useful, other core courses such as Environmental Statistics and Environmental Modeling have helped me set up research projects and methods needed for grants that I hope to obtain through Butler SWCD.

I felt most unprepared and uncomfortable dealing with the political atmosphere of Butler County, but that may be more a reflection of personal beliefs rather than any shortcoming with IES's Environmental Policy class, although that class was clearly not geared for local policy. One area where IES must seek improvement is technical course

offerings, both science-based and engineering. Although I arrived with a strong background in hydrology, the internship demanded more background knowledge of environmental engineering, restoration design, and even planning. I believe IES should try to get more into environmental engineering and environmental planning as well as provide course or class activities that expound on grant writing. Nonetheless, the entire IES experience has already helped me in obtaining employment and it will aid in my professional and career development, despite the field that I inevitably pursue.

Perhaps more than any other graduate school experience, my assistantship as a Graduate Instructor in the School of Interdisciplinary Studies provided me with the confidence that was absolutely necessary to be an effective communicator in presenting to peers on both sides of the issues at hand. I also feel that this experience forced me to obtain a greater understanding of what it takes to be an educator at all levels. In all, I feel that my graduate education, combined with my assistantship, provided me with the framework necessary to succeed at this position and, hopefully, positions yet to come.

Transferable Skills Attained

Employment with the Butler SWCD provided me with the opportunity to work in a professional atmosphere and apply my knowledge, skills, and abilities as I saw necessary to meet the goals of the District. The position demanded independent thinking and goal setting, skills which are critical to any job, and it really provided me the freedom to address and resolve problems that I felt were most pertinent to the division in which I worked. The position allowed me to work with an agency intimately committed to resolving environmental problems, and I feel that the opportunity truly enabled me to apply my academic background in a real-world setting.

The position primarily utilized my problem solving, public speaking and document writing skills, while strengthening other intangibles. An important part of this job, and every job, is good written and verbal communication. As a project leader and plan reviewer, it was important for me to develop clear communication with all stakeholders. I had to make concise, effective revisions to site plans as well as relay upcoming changes and new breakthroughs in regulations during formal presentations. Groups and subgroups that I worked with, such as Project SIGNs and the Ohio Stormwater Taskforce, also allowed me to

practice verbal communication and professional meeting organization. Perhaps more than any other skill attained, this internship required me to multi-task and prioritize those tasks accordingly. To better adapt this skill, I realized early on the importance of improving my capacity to undertake multiple tasks in order to compensate for a demanding schedule.

My computer skills were also enhanced. I gained valuable experience with databases and geographic information system (GIS) software as well an increased ability to modify websites and create web pages on a local server. I worked extensively with the most recent version of Arc View GIS (9.0) and even created and modified personal geodatabases on the county server. I also worked with specialty software for conservation projects, including UrbanSite and NRCS's Toolkit. Of course, I also made use of standard software programs such as Microsoft Access, Excel, PowerPoint and Word.

One of the most valuable skills that I attained was working for the government and obtaining a greater understanding of the regulations surrounding water resource management. I was constantly exposed to Clean Water Act (CWA) regulations, specifically regarding nationwide permits under Section 404 and 401. I improved my understanding of the Ohio NPDES Stormwater and Permit Program as well as stipulations of the Safe Drinking Water Act (SDWA). Interestingly, I got to observe several of my colleagues testify before the Ohio State Senate on behalf of H.B. 411, and I learned a great deal about the legislative process leading up to the formation of administrative code. Whether working for the government or a private consulting firm, a strong understanding of the rules and regulations surrounding the problems in which one is involved is always necessary.

Finally, the internship taught me the value of interdisciplinary partnerships. Environmental problems are rarely solved alone, and almost every project that I worked on demanded the collaboration of numerous parties in order to successfully complete. From private consultants to watershed groups, this position helped me form multiple partnerships across the public and private sector that I believe will only help Butler SWCD meet goals and complete projects in the future. For seemingly every project, and its underlying problem, I found that there are usually other stakeholders or groups that have experienced the same problem from a different angle. This internship taught me the value of tapping those resources, and reaching out to form partnerships may not have previously existed.

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APPENDICES

APPENDIX I. Position-Relevant Excerpts from Annual Plan of Operation

Annual Plan of Operations

Bulter County SWCD

2005

Butler SWCD
Annual Plan of Operations
January 1, 2005 – December 31, 2005

Objective 1: Increase Awareness of Water Quality

Goal 1: Educate School Aged Children & Adults

Action Items	Responsibility	Start Date	End Date	Completed
1. Organize at least 2 Teacher Workshop for area teachers	Lynn White Kevin Fall	01/01/05	12/31/05	☐
2. Conduct 100 school programs to grades Preschool – 12	Lynn White	01/01/05	12/31/05	☐
3. Participate in WaterFest for grades 5-6	Lynn White Jennifer Deaton Joel Thrash Kevin Fall Diane Puckett Ryan Smith	01/01/05	12/31/05	☐
4. Organize Area IV Envirothon for grades 9-12	Lynn White Kevin Fall Jennifer Deaton Joel Thrash Diane Puckett Ryan Smith	01/01/05	12/31/05	☐
5. Develop 10 new partnerships with schools	Lynn White Kevin Fall	01/01/05	12/31/05	☐
6. Write at least 5 Conservation articles for the SWCD newsletter	Joel Thrash Ryan Smith	01/01/05	12/31/05	☐

Butler SWCD
Annual Plan of Operations
January 1, 2005 – December 31, 2005

Objective 1: Increase the awareness of water quality and the reduction of non point source pollution in a watershed context

Goal 2: Educate Local Decision Makers, Homeowners, and Contractors/Developers

Action Items	Responsibility	Start Date	End Date	Completed
1. Prepare at least 1 press release packet and distribute to local media for the Butler County Storm Water District	Lynn White	01/01/05	12/31/05	☐
2. Organize 2 public meetings and 1 Citizen Discussion Panel on Water quality for the Butler County Storm Water District	Joel Thrash Lynn White	01/01/05	12/31/05	☐
3. Write at least 2 news articles to be used for the SWCD newsletter	Joel Thrash Jennifer Deaton	01/01/05	12/31/05	☐
4. Write at least 2 news articles to be used for local newspapers	Joel Thrash Jennifer Deaton	01/01/05	12/31/05	☐
5. Create portable displays highlighting water quality issues to be used at the County Fair, Monroe's Cityfest, River Days, and any other local events.	Lynn White	01/01/05	12/31/05	☐
6. Conduct 3 stream clean–ups program for Butler County Storm Water District	Joel Thrash Lynn White Kevin Fall	01/01/05	12/31/05	☐
7. Organize at least 1 stream monitoring program	Joel Thrash Lynn White Kevin Fall	01/01/05	12/31/05	☐

Continued

Butler SWCD
Annual Plan of Operations
January 1, 2005 – December 31, 2005

Continued : Objective 1, Goal 2

8. Conduct 3 educational stream walks	Joel Thrash Lynn White Kevin Fall	01/01/05	12/31/05	☐
9. Apply 300 Storm Drain Stencils for Butler County Storm Water District with volunteers.	Joel Thrash Lynn White	01/01/05	12/31/05	☐
10. Conduct a meeting for developers and design engineers concerning water quality issues related to development impacts (wetlands, headwater streams, water quality structures, etc.)	Jennifer Deaton Joel Thrash	01/01/05	12/31/05	☐
11. Conduct 2 joint pond clinics and present at 1 other pond program	Jennifer Deaton Ryan Smith	01/01/05	12/31/05	☐
12. Provide technical assistance to health department officials regarding soils capability and suitability in the siting of submitted aerobic lagoons for onsite sewage disposal	Jennifer Deaton Ryan Smith Jeff Barnes John Williams	01/01/05	12/31/05	☐
13. Get assistance from the health department in developing fact sheets on FAQ of sewage treatment options	Jennifer Deaton Lynn White	01/01/05	12/31/05	☐
14. Produce 2 newsletters for developers and homebuilders on related issues of erosion, stormwater management, drainage, urban hydrology, and water quality.	Joel Thrash Jennifer Deaton	01/01/05	12/31/05	☐

Butler SWCD
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January 1, 2005 – December 31, 2005

Objective 2: Reduce excessive soil erosion by monitoring erosion control practices in Butler County and promoting the use of new BMP's where appropriate.

Goal 1: Provide technical assistance to the public, developers, and local officials concerning the importance and need for effective erosion control / storm water management programs.

	Action Items	Responsibility	Start Date	End Datee	Completed
1.	Organize at least 1 erosion control field day for e/c installers, home builders and developers	Jennifer Deaton Joel Thrash	01/01/05	12/31/05	☐
2.	Review each SWPPP for every subdivision under our permit and provide feedback. Get compliance with structural and non structural water quality BMP's.	Joel Thrash	01/01/05	12/31/05	☐
3.	Inspect and follow up with each active construction site at least once every 2 months	Joel Thrash Urban Site Inspect.	01/01/05	12/31/05	☐
4.	Review all county subdivision plats submitted to Butler County and West Chester Township as well as give input on zoning requests, replats, lot splits, and block grant projects.	Jennifer Deaton	01/01/05	12/31/05	☐
5.	Assist the Butler County Storm Water District in developing a draft construction control ordinance with sanctions & implement ordinance	Jennifer Deaton Joel Thrash	01/01/05	12/31/05	☐
6.	Start SWCD Earth Moving Permit and fee implementation and strive for compliance	Jennifer Deaton Joel Thrash Kevin Fall	01/01/05	12/31/05	☐

continued

Continued : Objective 2, Goal 1

Butler SWCD
Annual Plan of Operations
January 1, 2005 – December 31, 2005

7.	Strengthen relationship between OEPA (State and District Offices) and Butler SWCD to better implement both the NPDES permit and our Earth moving permit by formalizing our verbal working agreement	Jennifer Deaton Joel Thrash Kevin Fall	01/01/05	12/31/05	□
8.	Organize an Urban Tour for SWCD Supervisors	Jennifer Deaton Joel Thrash	01/01/05	12/31/05	□
9.	From public/residential drainage, erosion, water quality call-ins or problems give advice and help design and install at least 2 BMP structures to solve a problem. Follow up with results and efficacy.	Jennifer Deaton Ryan Smith Joel Thrash	01/01/05	12/31/05	□

Butler SWCD
Annual Plan of Operations
January 1, 2005 – December 31, 2005

Objective 3: Increase of Awareness of Butler SWCD in Butler County

Goal 1: Educate government, local agencies, schools and public of different programs and services offered

Action Items	Responsibility	Start Date	End Date	Completed
1. Recruit at least one advertiser for the District quarterly newsletters, ag newsletter, or urban newsletter	Lynn White Joel Thrash Ryan Smith Kevin Fall Jennifer Deaton	01/01/05	12/31/05	☐
2. Promote and fully book the Air Tours through newsletters, word of mouth and news releases	Kevin Fall Lynn White Diane Puckett	01/01/05	12/31/05	☐
3. Develop a hit counter for Website and promote/ increase its use through newsletters, brochures, etc.	Kevin Fall Lynn White Diane Puckett	01/01/05	12/31/05	☐
4. Organize and participate in booths at the County fair, city festivals, and other venues	Kevin Fall Lynn White Diane Puckett Jennifer Deaton Joel Thrash Ryan Smith	01/01/05	12/31/05	☐
5. Promote and improve Annual Banquet and increase attendance and participation to 180 people	Lynn White Kevin Fall Diane Puckett	01/01/05	12/31/05	☐
6. Organize and promote annual tree sale through newsletters and news releases to sell at least 2500 tree packets	Lynn White Kevin Fall Diane Puckett	01/01/05	12/31/05	☐
7. Increase district news release articles written to at least one per month to be used for local newspapers	Kevin Fall Lynn White Joel Thrash Ryan Smith	01/01/05	12/31/05	☐

continued

APPENDIX II. Key Stakeholder Concerns

Stakeholders / Annual Planning Meeting
April 14, 2003
Minutes

Those in attendance: SWCD Board members/employees: Norb Lerch, Barb Reisenauer, David Carter, John Kellis, Jennifer Deaton, Tim Wilson, Diane Puckett, and Pete Berard; Amy Cottongim-FSA, Sherry Fishbaugh-Butler Rural Electric Co-Op, Ray Zehler-Izaak Walton League, Scott Costello-Ohio Division of Forestry, Peggy Collins-Miami Valley RC&D, Nancy Ellwood-Mill Creek Watershed Council, David Brate-farm manager, Jim Gifford-landowner, and Don Eberwine-OSU Extension.

Norb Lerch thanked everyone for coming, and also Joyce Schul and her husband for catering the breakfast.

Dave Carter introduced the staff and had stakeholders introduce themselves and the organization they represented. He then went over the hand-outs – the State Organization Chart and brochure *What is Butler SWCD*?.

John Kellis handed out a survey of natural resource issues. There were five areas on this survey that he asked the stakeholders to rank in order of importance. He then asked for audience participation to come up with each persons priority concerns.

When this was done, he asked the audience to further prioritize their concerns, as a group, and he ended up with the top 10 priority concerns of natural resource issues. They are as follows:

Top Priority Concerns

Flooding
*Farmland Conversion/ Farmland Loss/ Loss of Forest Lands
*Stream Mgt./ Streambank Protection
Water Quality
Urban Land Management
Recreation
Stormwater Management
*Soil Erosion/ Sediment Control
Soil Survey
Pesticide Management
Right-of-way herbicide application
Invasive Plant Species
Agri Sustainability
Agri Productivity
Air Quality
Wetlands
Education (Youth)
Riparian Corrider Enhancement
Polluted Urban run-off
Water Management (Use)
Wildlife Management
Water Supplies
Animal Waste Management
Solid Waste Management

Top 10 Priorities

1. Land Conversion
2. Erosion & Sediment Control
3. Water Quality
4. Stormwater Management
5. Urban Land Management
6. Education
7. Riperian Corrider Management
8. Pesticide Management
9. Stream Protection
10. Wetlands

** These items were combined*

APPENDIX III. Example Plan Review

"Natural Resource Management"

"Soil and Water Conservation Districts of Ohio"

Butler Soil and Water Conservation District

1810 Princeton Road
Hamilton, Ohio 45011
www.butlercountyohio.org/conservation

Telephone: (513) 887-3720 or
Middletown: 424-5351
FAX: (513) 785-6668

December 21, 2004

Welsh Development
Attn: Jeff Van Fossen
9336 Dick Road
Harrison, OH 45030

RE: Plan Review for Cedarbrook Section 8

Dear Mr. Van Fossen:

On Tuesday December 21st, I walked Section 8 of your Cedarbrook subdivision located off Conifer Drive in Liberty Township. During the visit and visual inspection of the property, I was also able to review the plans sent to our office on December 9th. The review was conducted for the purpose of evaluating erosion and sediment control in accordance with Butler County Subdivision Regulations (Article VII) and your NPDES General Permit (OHR109731) for Stormwater Discharges Associated with Construction Activities.

Based on the review and visit, I have the following concerns that need addressed:

1.) Our records indicate that a large agricultural operation, presumably chicken farming, functioned on this property from the 1960s to at least 1987. During my site visit, the remains of this operation could be seen as mounds of metal and barrels of drums littered the landscape (Figure 1 and 2). There also appeared to be evidence of a 'homemade' waste disposal area in bowl-shaped area located in the vicinity of the eastern-most cul-de-sac of Maple Leaf Court. Our office highly recommends that an environmental consultant is contacted to perform a formal Phase I Environmental Site Assessment.

2.) Your plans show that the existing pond will be drained and filled as part of this development (Figure 3). There are specific guidelines with regards to draining ponds, and our office is more than willing to walk you through these steps. Above all, however, the pond must be drained (siphoned) from the water surface elevation and **not** pumped from the bottom. The concentrated animal feeding operation on this property during the past half century has likely inundated this pond with sediment and animal waste (nitrates!). Once the upper 80% of the water has been siphoned, the remaining sediment and water should be dewatered and properly disposed. Another option is to pass all pond water through a Geotube® or other approved dewatering device, and it is critical that all water and sediment drained from this pond is discharged to the existing tributary to the south and **not** directly to Panther Run. Please make sure that your contractor knows to contact us **before** this process begins.

3.) Temporary riser pipes must be placed on all stormwater detention basin outlets in order to control sediment during the construction phase. If perforated, riser pipes should be surrounded by small gravel, and they may be removed when 80% of the upland area is seeded. Both of your basins outlet off site, and they should be given rock channel outlet protection in the form of 6-8" stone pursuant the specifications outlined in the Rainwater and Land Development Manual.

4.) Silt fence also needs to be installed on a couple areas of your site. Most notably, silt fence should be installed on the 754ft contour between lots 234-238; along the clearing and grading limits between lots 265-267; and along the clearing and grading limits between lots 259-262. Please understand that existing can be mulched and used in lieu of silt fence. Our office highly recommends such mulch berms as perimeter control. Silt fence often requires more installation time, maintenance, and incurs a greater cost per linear foot.

5.) Two small sediment traps, with approximately 200ft^3 of storage, should be installed at the end of the silt fence on the borders of Lots 264 & 265 and 238 & 239. These sediment traps, equipped with a 2-6" rock outlet structure, are simple and cheap methods to collect concentrated flow diverted by silt fence and earth moving activities.

6.) Your erosion control plan did not specifically address inlet protection, although it is provided on your legend and in the detail sheets. Starting Jan.1, 2005, the Butler Co. Engineers Office will no longer accept gravel baskets. For inlet protection, please use acceptable devices such as Dandy Beaver Dams®, compost logs, the SiltSaver®, The BMP Stores Gutter Buddy® or other approved BMPs that meet Phase II requirements.

7.) Please update the contractor notes on your plan to reflect the requirements of your NPDES permit. Most notably, the temporary seeding requirement has been reduced from 45 days to 21 days.

The concerns spelled out in this plan review should be revised before construction activities commence. Additionally, please be certain to schedule a pre-construction meeting on site when a contractor bid has been accepted. In compliance with Butler County's new Earth Moving Permit, this meeting **must** be held before construction activities begin. I appreciate your willingness to revise your plans and correct these concerns which are important with respect to water quality within the Gregory Creek Watershed. If you have any other questions or concerns please feel free to contact me at 513-887-3720 or at thrashjp@butlercountyohio.org.

Sincerely,

Joel P. Thrash

cc: Jennifer Richmond, Kleingers & Associates

Figure 1. Metal and scrap waste from past land uses

Figure 2. Metal drums along Panther Run

Figure 3. Debris and large waste littered throughout this area

Figure 4. Existing pond to be drained

Figure 5. More solid (metal) waste.

APPENDIX IV. Example Notice of Violation Major

"Natural Resource Management"

"Soil and Water Conservation Districts of Ohio"

Butler Soil and Water Conservation District

1810 Princeton Road
Hamilton, Ohio 45011
www.butlercountyohio.org/conservation

Telephone: (513) 887-3720 or
Middletown: 424-5351
FAX: (513) 785-6668

November 10, 2004

Mr. Robert Glover
Hines-Griffin Land Development Co.
8180 Corporation Park Drive, Suite 204
Cincinnati, OH 45236

RE: Notice of Violation for Grace Meadows Subdivision

Dear Mr. Glover

On November 4, 2004 I visited your Grace Meadows subdivision located just off Tylersville Road in West Chester Township. The purpose of my visit was to inspect the erosion and sediment (ESC) controls on your site for compliance with Butler County Subdivision Regulations (Article VII) and your NPDES General Permit (#OHC000002-1GC00860*AG) for Stormwater Associated with Construction Activities. Following the inspection, I had some concerns regarding the lack of ESC devices in the field, the timing of your project, and your stormwater pollution prevention plan (SWP3). This letter is to inform you that your site is in violation of Butler County Subdivision Regulations and your NPDES Permit. Summarizing the inspection, I had the following concerns and/or violations which require corrective actions:

1.) As of the date of this letter, no ESC or SWP3 plan has been submitted to our office or the Butler County Department of Planning. Our office requires that your engineers submit, and have approved, construction drawings with one of these plans to control sediment laden stormwater. These plans are required to be sent to our office or the planning department before any grading begins. Beginning Jan 1, 2005 our office will be imposing a penalty for moving earth without the necessary permit (Butler County ESC Earth Moving Permit).

2.) At the time of the inspection, no sediment or erosion controls required by your NPDES permit were observed on site. Some mulch berms had been appropriately implemented on the east side of the site; however, the majority of your site drains to the west and south, where no controls were observed. In fact, illicit discharges of sediment laden water were observed leaving your site (Figure 1).

3.) Sediment and erosion control devices, including sediment basins, are required within seven (7) days of the start of first grubbing and before the initial grading occurs. As per your NPDES Permit, sediment basins are required for all sites over 10 acres. Please ensure that a sediment basin is installed immediately and that this basin is not sited in existing streams. Sediment basins are required to collect runoff in areas where concentrated flow exits your site. Please ensure that this sediment basin is installed above the confluence of the two streams in lots 36/37 (Figure 2). If a post-construction stormwater detention basin has been cited in this vicinity, it should be built immediately and modified with a slow release riser pipe in order to collect sediment. Again, basins should not be cited in the streams themselves unless the appropriate permits are obtained from the US Army Corps of Engineers and the Ohio EPA.

4.) The existing streams and riparian zones on your site have been severely altered by construction (Figure 3 and 4). Over 300 total linear feet of stream(s) have been impacted by your project. These streams may be regulated waters by the Army Corps of Engineers or the Ohio EPA. You must obtain the necessary 404 Permit from the US Army Corps of Engineers and/or the necessary 401 Water Quality Permit from the Ohio EPA in order to perform work in regulated waters. Please contact these authorities to ensure that you have obtained the appropriate permits and authorization forms. The contacts you will need are Denise Marmer (USACE) 513-825-4518 and Mike Smith (OEPA) 614-644-2326.

5.) Erosion rills and gullies were observed to be forming on slopes along the waterways on your site (Figure 4). These features indicate that unstable soils are eroding and being transported downstream. Your NPDES permit requires that all barren areas within 50 feet of a stream (concentrated flow) should be stabilized within two (2) days. Please ensure that these slopes are stabilized immediately, and that matting is used on all slopes greater than 2:1.

6.) Perimeter controls must be placed around the site at any point where sediment might discharge off of your property. A great deal of existing vegetation has been mulched on your site; however, mulch berms (sediment barriers) were only observed in lots 3-6. Mulch berms are an acceptable, even recommended, Phase II best management practice (BMP). Our office appreciates your contractor using this BMP in lieu of silt fence. However, please extend these perimeter controls behind the lots on the south side of Scotch Court and along the entire east perimeter. (Figure 5)

7.) Concentrated flow was observed to be leaving the site in one specific area in Lots 6-8., and it appears that a small sediment trap with a rock check outlet is appropriate in this area (Figure 6). Please have your contractor install a temporary sediment trap just upland of the existing tree line in order control off site sediment flows.

8.) Finally, as a general reminder, all areas which are at or near final grade, or which will remain dormant for more than 21 days, should be seeded and straw mulched within seven (7) days. Please make note that the seeding requirement in your NPDES general permit has been reduced from 45 days to 21 days.

For your information, our office has begun phasing in formal plan reviews of erosion and sediment control plans submitted for subdivisions and some commercial sites. Starting on January 1, 2005, a new County permit authorizing Butler SWCD to approve all ESC plans and perform inspections will need to be obtained for all developments located within Butler County's jurisdiction.

I have briefly discussed some of the problems highlighted in this letter with Broshear Contractors; however, I would like to meet with you, your engineer and Broshear concerning these issues which are important with respect to water quality in the Mill Creek Watershed. I look forward to working with you to address and correct these matters. Please respond, in writing, to the concerns of this letter within 10 days upon receipt. If you have any other questions please feel free to contact me at 513-887-3720 or at thrashjp@butlercountyohio.org.

Sincerely,

Joel P. Thrash, M.En

cc: Denny Benson, Broshear Contractors
James H. Watson, PE, McGill Smith Punshon, Inc.

Figure 1. Pipe under temporary stream crossing has been filled with sediments from construction site. This sediment laden water discharges off-site (Looking North)

Figure 2. Confluence of drainage swale and ephemeral stream. Sediment basin should not be placed in streams. An appropriate location is just above this confluence.

Figure 3. Existing Stream has been graded and left undisturbed

Figure 4. Existing drainage route exposed and erosion rills forming on slopes.

Figure 5 Northeast Lots need perimeter controls (silt fence or mulch berms)

Figure 6. Concentrated flow leaving site behind Lot

Example Notice of Violation (Minor)

Butler Soil and Water Conservation District

1810 Princeton Road
Hamilton, OH 45011
www.butlercountyohio.org/conservation

Phone: 513/887-3720
Fax: 513/785-6668
Email: butlerswcd@yahoo.com

Development Section/Phase: Reserves of Elk Pointe
Date: 9/30/04
Date of Inspection: 9/28
Time: 10:45am
Inspector: J.Thrash

Contact: Shane Delong, Todd Development
Ben House, Mt. Pleasant
Phone: 513-777-5443

Butler County Subdivision Regulations[1]
Erosion and Sediment Control (ESC)
Inspection Report

Violation(s)

1.) Butler County requires all construction sites to have a rock construction entrance at least 50 ft long and 30 ft wide. The entrance should be comprised of 2-4" stone at a depth of 6 inches. Please ensure that a proper construction entrance is installed.

2.) The sediment trap on your site has been inappropriately placed in the existing stream channel. The revised plans sent by Bayer Becker on 9/3/04 show this trap sited out of the stream. Please remove the rock outlet channel from the stream, stabilize the banks, and install the sediment trap upland of the stream channel.

3.) Silt fence was not observed on the areas spelled out during our 8/20/04 pre-construction meeting. Please install the 410 and 650 linear feet of silt fence around the south cul-de-sac as spelled out on your revised construction drawings.

4.) All areas which will remain barren for more than 45 days should be seeded and mulched within 7days. It appears that several areas of your site are at final grade and should be seeded. Please see that all areas at final grade are seeded, and that all areas within 50 feet the stream are seeded within 2 days.

Additional Comments:

Since there are no basins on your site, it is extremely important that inlet protection (IP) is installed properly and maintained throughout construction to prevent off-site discharges of sediment-latent water. When storm sewers are installed, please give serious consideration to other forms of IP such as compost logs, Dandy Beaver Dams®, The BMPStore's Gutter Buddy®, or other approved Phase II BMPs. If you have any questions or concerns regarding the inspection or ESC controls in general, please feel free to contact me anytime.

Inspector Signature: _____

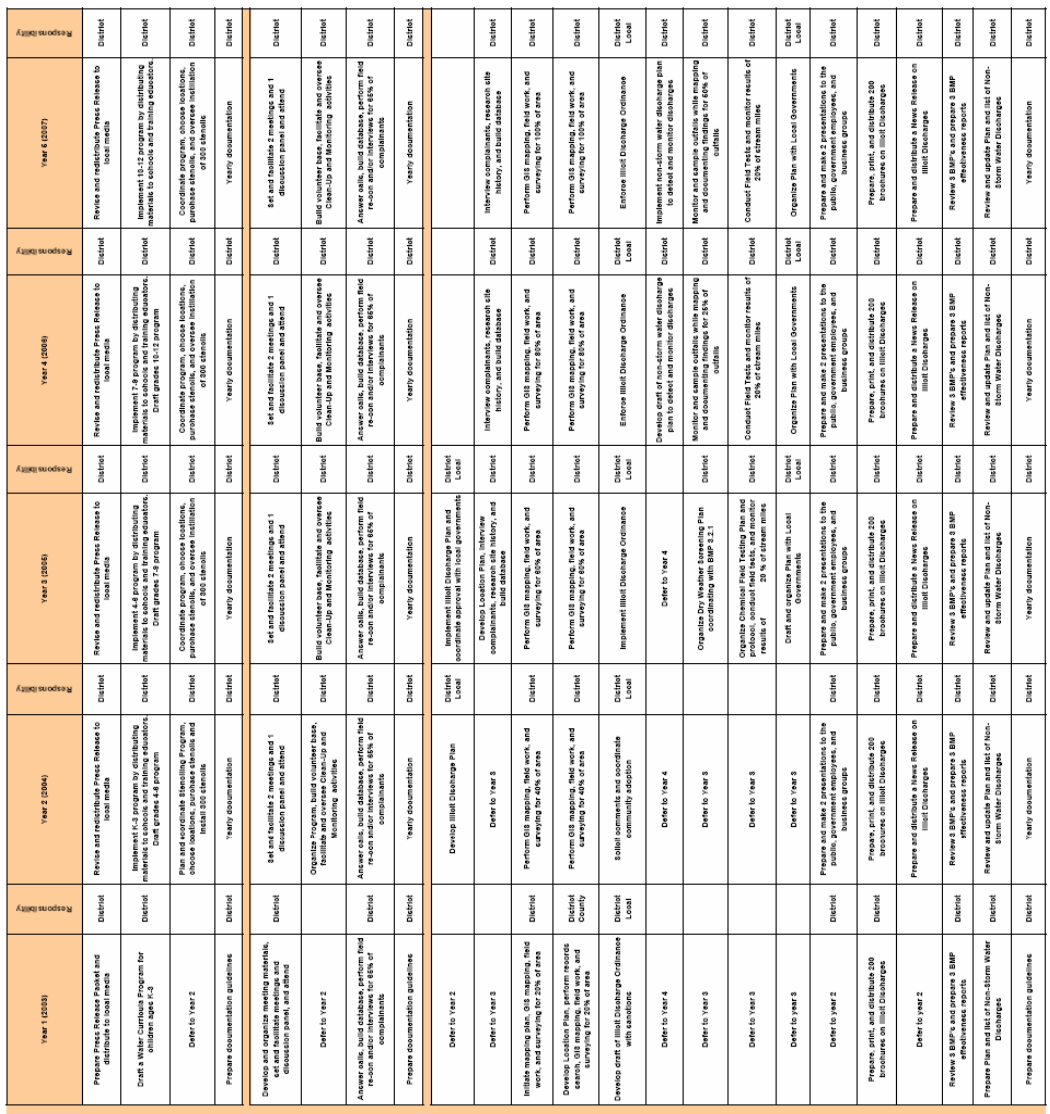
[1]Inspection conducted in accordance with Butler County Subdivision Regulations Article VII-7.05. Failure to comply with ESC regulations may result in enforcement actions, denial of building permits, and/or rejection of record approval.

APPENDIX V. Site Development Process through the Butler SWCD

BUTLER SWCD
The URBAN 20-STEP PROGRAM [1]
FLOWCHART w/ Regards to Erosion and Sediment Controls (ESCs)

1.) Developer hires Engineer/Surveyor to subdivide land and design preliminary plat
2.) Developer acquires land zoned Residential, A-1, or R-PUD or goes through zone change approval from Planning Commission
3.) Preliminary Plat reviewed by all County agencies
4.) Approval Granted or Denied at Planning Commission Meeting on 2nd Tuesday of every month. Geotechnical reports or soils reports may be requested
5.) If approved, go to 6. If denied, go to 2
6.) Construction drawings designed by an Engineer consultant. Must be submitted to Planning Department, who then sends copies to all reviewing agencies (BCEO, BCDES, SWCD, B&Z, H, TWP, Plat)
7.) Developer must apply for all necessary permits. Regarding sediment and erosion control, permit coverage must be obtained under the Ohio EPA's National Pollutant Discharge Elimination System (NPDES) General Permit for Storm Water Associated with Construction Activities (OHR00002). *Butler County Subdivision Regulations Article VII Section 7.04 (A) states that the Butler SWCD must **also** approve a permit prior to any earth-disturbing activities.*
8.) Construction drawings must have an erosion and sediment control plan, AKA the Stormwater Pollution Prevention Plan (SWPPP), with a detail sheet and a grading plan to comply with County and NPDES regulations. These are usually 2-3 pages of the plans.
9.) Grading and ESC plan are reviewed by Butler SWCD.
10.) Upon approval, developer and contractor hold preconstruction meeting with BSWCD
11.) Revisions from all county agencies are made to construction drawings.
12.) Construction activities may commence on site
13.) Inspections during construction phase begin. Violations noted. Violations may result in a formal letter, inspection report sent to the developer or verbal notification to developer or contractors on site
14.) Follow-up Inspections are performed until compliance status reached
15.) Final Plat approval is granted from Planning Commission somewhere between 10-13
16.) Once at final grade, temporary or permanent seeding must be established within 7 days.
17.) Before site/section is recorded, approval is needed from Butler SWCD on all erosion controls
18.) Plat is recorded, signed by Commissioners and lots are sold
19.) Individual lot inspections are needed (Building & Zoning, Butler SWCD) BCEO in the future.
20.) Maintenance on erosion controls continues until all homes are built

APPENDIX VI. Butler County Phase II Stormwater BMP Matrix



MCM No.	Minimum Control Measure	BMP No.	BMP's	Measurable Goals	Year 1 (2003)	Responsible Party	Year 2 (2004)	Responsible Party	Year 3 (2005)	Responsible Party	Year 4 (2006)	Responsible Party	Year 5 (2007)	Responsible Party
1	Public Education and Outreach	1.1.1	Media Awareness Packet	Annually prepare at least one Press Release Packet and distribute to local Media	Prepare Press Release Packet and distribute to local media	District	Revise and redistribute Press Release to local media	District	Revise and redistribute Press Release to local media	District	Revise and redistribute Press Release to local media	District	Revise and redistribute Press Release to local media	District
		1.1.2	Education Program for Local Schools	Adopt and distribute K-12 Water Curricula Program within 6 years	Draft a Water Curricula Program for children ages K-3	District	Implement K-3 program by distributing materials to schools and training educators. Draft grades 4-6 program	District	Implement 4-6 program by distributing materials to schools and training educators. Draft grades 7-9 program	District	Implement 7-9 program by distributing materials to schools and training educators. Draft grades 10-12 program	District	Implement 10-12 program by distributing materials to schools and training educators.	District
		1.1.3	Storm Drain Stenciling	Purchase and coordinate installation of 800 stencils per year until all basins in District are marked, beginning year 2	Defer to Year 2		Plan and coordinate Stenciling Program, choose locations, purchase stencils and install 800 stencils	District	Coordinate program, choose locations, purchase stencils, and oversee installation of 800 stencils	District	Coordinate program, choose locations, purchase stencils, and oversee installation of 800 stencils	District	Coordinate program, choose locations, purchase stencils and oversee installation of 800 stencils	District
		1.2.1	Document Decision Process	Document Decision Process	Prepare documentation guidelines	District	Yearly documentation	District	Yearly documentation	District	Yearly documentation	District	Yearly documentation	District
2	Public Involvement / Participation	2.1.1	Public Meetings and Citizen Discussion Panels	Hold two (2) Public Meetings and One (1) Citizen Discussion Panel per year until Program is implemented	Develop and organize meeting materials, set and facilitate meetings and discussion panel, and attend	District	Set and facilitate 2 meetings and 1 discussion panel and attend	District	Set and facilitate 2 meetings and 1 discussion panel and attend	District	Set and facilitate 2 meetings and 1 discussion panel and attend	District	Set and facilitate 2 meetings and 1 discussion panel and attend	District
		2.2.2	Stream Clean-up & Monitoring	Facilitate and oversee one Stream Clean-Up and Monitoring Program each year beginning year 2	Defer to Year 2		Organize Program, build volunteer base, facilitate and oversee Clean-Up and Monitoring activities	District	Build volunteer base, facilitate and oversee Clean-Up and Monitoring activities	District	Build volunteer base, facilitate and oversee Clean-Up and Monitoring activities	District	Build volunteer base, facilitate and oversee Clean-Up and Monitoring activities	District
		2.2.3	Storm Water Hotline, Database, and Response Program	Document complaints received and focuse and reduce response to 85% per year	Answer calls, build database, perform field re-con and coordinate response for 65% of complainants	District	Answer calls, build database, perform field re-con and coordinate response for 65% of complainants	District	Answer calls, build database, perform field re-con and coordinate response for 65% of complainants	District	Answer calls, build database, perform field re-con and coordinate response for 65% of complainants	District	Answer calls, build database, perform field re-con and coordinate response for 65% of complainants	District
		1.2.1	Document Decision Process	Document Decision Process	Prepare documentation guidelines	District	Yearly documentation	District	Yearly documentation	District	Yearly documentation	District	Yearly documentation	District
3	Illicit Discharge Detection and Elimination	3.1.1	Illicit Discharge Plan	Develop Illicit Discharge Plan and coordinate approval by member local governments	Defer to Year 2		Develop Illicit Discharge Plan	District Local	Implement Illicit Discharge Plan and coordinate approval with local governments	District Local				
		3.1.1.1	Locate Problem Areas	Develop Problem Area Database beginning year 3	Defer to Year 3		Defer to Year 3		Develop Location Plan, interview complainants, research site history, and build database	District	Interview complainants, research site history, and build database	District	Interview complainants, research site history, and build database	District
		3.2.1	Storm Sewer System Map with Outfalls	Field locate outfalls and map 20% of District area each year	Initiate mapping plan; GIS mapping, field work, and surveying for 20% of area	District	Perform GIS mapping, field work, and surveying for 40% of area	District	Perform GIS mapping, field work, and surveying for 60% of area	District	Perform GIS mapping, field work, and surveying for 80% of area	District	Perform GIS mapping, field work, and surveying for 100% of area	District
		3.8.1	HSTS List and Map	Field locate HSTS and map 20% of the area each year	Develop Location Plan, perform records search, GIS mapping, field work, and surveying for 20% of area	District County	Perform GIS mapping, field work, and surveying for 40% of area	District	Perform GIS mapping, field work, and surveying for 60% of area	District	Perform GIS mapping, field work, and surveying for 80% of area	District	Perform GIS mapping, field work, and surveying for 100% of area	District
		3.4.1	Illicit Discharge Ordinance	Establish Illicit Discharge Ordinance for District with cancellons	Develop draft of Illicit Discharge Ordinance with cancellons	District Local	Solicit comments and coordinate community adoption	District Local	Implement Illicit Discharge Ordinance	District Local	Enforce Illicit Discharge Ordinance	District Local	Enforce Illicit Discharge Ordinance	District Local
		3.6.1	Non-Storm Water Discharge Plan	Establish non-storm water discharge plan and fully implement within five years	Defer to Year 4		Defer to Year 4		Defer to Year 4		Develop draft of non-storm water discharge plan to detect and monitor discharges	District	Implement non-storm water discharge plan to detect and monitor discharges	District
		3.6.1.1	Dry Weather Screening	Prepare Dry Weather Screening Plan and sample and complete for District each year, beginning year 4	Defer to Year 3		Defer to Year 3		Organize Dry Weather Screening Plan coordinating with BMP 3.2.1	District	Monitor and sample outfalls while mapping and documenting findings for 25% of outfalls	District	Monitor and sample outfalls while mapping and documenting findings for 45% of outfalls	District
		3.6.1.2	Chemical Field Tests	Develop field testing protocol, purchase equipment and sample 20% of stream miles in District each year, beginning year 3	Defer to Year 3		Defer to Year 3		Organize Chemical Field Testing Plan and protocol, conduct field tests, and monitor results of 33 % of stream miles	District	Conduct Field Tests and monitor results of 20% of stream miles	District	Conduct Field Tests and monitor results of 20% of stream miles	District
		3.6.1.3	Coordinate screening & testing plan with Local Governments	Organize Cooperative Screening and Testing Plan	Defer to Year 3		Defer to Year 3		Draft and organize Plan with Local Governments	District Local	Organize Plan with Local Governments	District Local	Organize Plan with Local Governments	District Local
		3.8.1	Provide information about Hazards of Illicit Discharges	Make at least two (2) presentations per year to local groups on Illicit Discharge	Defer to year 2	District	Prepare and make 2 presentations to the public, government employees, and business groups	District	Prepare and make 2 presentations to the public, government employees, and business groups	District	Prepare and make 2 presentations to the public, government employees, and business groups	District	Prepare and make 2 presentations to the public, government employees, and business groups	District
		3.8.1.1	Illicit Discharge Brochure	Draft, print and distribute 200 brochures on Illicit Discharges per year	Prepare, print, and distribute 200 brochures on Illicit Discharges	District	Prepare, print, and distribute 200 brochures on Illicit Discharges	District	Prepare, print, and distribute 200 brochures on Illicit Discharges	District	Prepare, print, and distribute 200 brochures on Illicit Discharges	District	Prepare, print, and distribute 200 brochures on Illicit Discharges	District
		3.8.1.2	News Releases on Illicit Discharges	Prepare and distribute one (1) news release per year, beginning year 2, on Illicit Discharges to local media	Defer to year 2		Prepare and distribute a News Release on Illicit Discharges	District	Prepare and distribute a News Release on Illicit Discharges	District	Prepare and distribute a News Release on Illicit Discharges	District	Prepare and distribute a News Release on Illicit Discharges	District
		3.7.1	Monitor BMP's	Monitor each Installed BMP at least every other year	Review 3 BMP's and prepare 3 BMP effectiveness reports	District	Review 3 BMP's and prepare 3 BMP effectiveness reports	District	Review 3 BMP's and prepare 3 BMP effectiveness reports	District	Review 3 BMP's and prepare 3 BMP effectiveness reports	District	Review 3 BMP's and prepare 3 BMP effectiveness reports	District
		3.8.1	List and Restrict Non-Storm Water Discharges	Prepare Plan to Restrict Non-Storm Water Discharges and implement within three years	Prepare Plan and list of Non-Storm Water Discharges	District	Review and update Plan and list of Non-Storm Water Discharges	District	Review and update Plan and list of Non-Storm Water Discharges	District	Review and update Plan and list of Non-Storm Water Discharges	District	Review and update Plan and list of Non-Storm Water Discharges	District
		3.8.1	Document the Decision Process	Document Decision Process	Prepare documentation guidelines	District	Yearly documentation	District	Yearly documentation	District	Yearly documentation	District	Yearly documentation	District

MCM No.	Minimum Control Measure	BMP No.	BMP's	Measurable Goals	Year 1 (2003)	Responsibility	Year 2 (2004)	Responsibility	Year 3 (2005)	Responsibility	Year 4 (2006)	Responsibility	Year 5 (2007)	Responsibility
4	Construction Site Storm Water Runoff Control	4.1.1	Construction Control Ordinance	Enact Construction Control Ordinance and implement within five years.	Develop Draft Construction Control Ordinance with sanctions	District	Implement Ordinance	District	Implement Ordinance	District	Enforce Ordinance	District	Enforce Ordinance and review program	District
		*4.1.1.1	Runoff Control BMP's	Implement Runoff Control BMP Plan and enforce within 3 years	Defer to year 2		Draft BMP Plan	District	Implement and enforce BMP Plan	District	Enforce BMP Plan	District	Enforce BMP Plan	District
		*4.1.1.2	Erosion Control BMP's	Implement Erosion Control BMP Plan and enforce within 4 years	Defer to year 3		Defer to year 3	District	Draft BMP Plan	District	Implement and enforce BMP Plan	District	Enforce BMP Plan	District
		*4.1.1.3	Sediment Control BMP's	Implement Sediment Control BMP Plan and enforce within 4 years	Defer to year 3		Defer to year 3	District	Draft BMP Plan	District	Implement and enforce BMP Plan	District	Enforce BMP Plan	District
		4.1.2	Site Plan Review and Inspection Process	Develop Site Plan Review and Inspection Process and enforce within three years	Develop Site Plan Review and Inspection Process Plan	District	Develop Site Plan Review and Inspection checklist and manual	District	Enforce Site Plan Review and Inspection Plan	District	Enforce Site Plan Review and Inspection Plan	District	Enforce Site Plan Review and Inspection Plan and review program	District
		4.2.1	Document the Decision Process	Document Decision Process	Prepare documentation guidelines	District	Yearly documentation	District	Yearly documentation	District	Yearly documentation	District	Yearly documentation	District
5	Post Construction Storm Water Management	*5.1.1	Post construction Ordinance with Riparian Corridor (RC) and Buffer Zone (BZ)	Enact Post Construction Ordinance with Riparian Corridor (RC) and Buffer Zone (BZ) within five years	Develop Draft Post Construction Ordinance with Riparian Corridor (RC) and Buffer Zone (BZ)	District County	Solicit comments from public and communities adopt ordinance	District	Implement and enforce RC and BZ ordinance	District County	Enforce RC and BZ ordinance	District County	Enforce RC and BZ ordinance and review program	District County
		5.1.1.1	Long Term O&M of RC and BZ	Develop a Plan for Long Term O&M of RC and BZ and implement within five years	Develop Draft of Long Term O&M Plan of RC and BZ	District County	Solicit comments from public and communities adopt Plan	District Local	Implement O&M Plan	District County	Implement O&M Plan	District County	Implement O&M Plan	District County
		*5.1.2	Update Zoning Ordinances	Develop Draft of Updated Zoning Ordinances within five years	Defer to year 3		Defer to year 3		Obtain copies of existing Zoning Ordinances	District	Draft an update of Zoning Regulations	District County	Implement new Zoning Ordinances	District County
		5.1.2.1	Long Term O&M of Zoning Ordinances	Develop a Plan for Long Term O&M of Zoning Ordinances within five years	Defer to year 4		Defer to year 4		Defer to year 4	District County	Develop a Draft Plan for Long Term O&M of Zoning Ordinances	District County	Implement O&M Plan	District County
		5.2.1	Document the Decision Process	Document Decision Process	Prepare documentation guidelines	District	Yearly documentation	District	Yearly documentation	District	Yearly documentation	District	Yearly documentation	District
6	Pollution Prevention / Good Housekeeping	6.1.1	Train Government Employees	Establish Plan for & training Government Employees and train 26% of them beginning year 2	Develop Training materials and Plan	District County	Produce training materials and hold training sessions for 26% of government maintenance employees	District County	Produce training materials and hold training sessions for 50% of government maintenance employees	District County	Produce training materials and hold training sessions for 75% of government maintenance employees	District County	Produce training materials and hold training sessions for 100% of government maintenance employees	District County
		*6.1.1.1	Maintenance Schedule	Develop Maintenance Plan and Schedule within 4 years	Defer to year 2		Develop Maintenance Plan	District County	Coordinate with local entities to develop schedule	District County	Implement Maintenance Plan and Schedule	District County	Implement Maintenance Plan and Schedule	District County
		6.1.1.2	Inspection Plan for BMP's	Develop Inspection Plan for BMP's and inspect half of BMP's each year, beginning year 2	Develop Inspection Plan and schedule	District County	Coordinate with local entities to develop Plan and schedule inspection of 50% of BMP's	District County	Coordinate with local entities to develop Plan and schedule inspection of 60% of BMP's	District County	Coordinate with local entities to develop Plan and schedule inspection of 50% of BMP's	District County	Coordinate with local entities to develop Plan and schedule inspection of 60% of BMP's	District County
		6.1.2	Illegal Dumping and Control Program	Develop Plan for Illegal Dumping and Control Program within five years	Defer to year 3		Defer to year 3		Develop draft of Illegal Dumping and Control Program	District County	Implement Illegal Dumping and Control Program	District County	Continue Illegal Dumping and Control Program	District County
		6.2.1	Document the Decision Process	Document Decision Process	Prepare documentation guidelines	District	Yearly documentation	District	Yearly documentation	District	Yearly documentation	District	Yearly documentation	District

APPENDIX VII. Storm Drain Labeling Project

Press Release

Butler Soil and Water Conservation District

1810 Princeton Road
Hamilton, Ohio 45011
www.butlercountyohio.org/conservation

Telephone: (513) 887-3720 or
Middletown: 424-5351
FAX: (513) 785-6668

NEWS RELEASE

August 4, 2004

Butler County Begins Phase II Storm Drain Labeling Project

Contacts:
Joel Thrash, Butler SWCD, thrashjp@butlercountyohio.org, 887-3720
Bob Lentz, Butler County Stormwater District, lentzb@stormwaterdistrict.org, 785-4120

HAMILTON, Ohio- The Butler County Stormwater District, in cooperation with the Butler County Soil and Water Conservation District (SWCD), will be conducting its first series of storm drain labeling efforts. The first labels will be installed Aug. 14 at 8:00 am at the Ascot Downs subdivision just off Morris Road in Fairfield Twp. and Aug 21 at 9:00am in the Hughes Woods subdivision just off Princeton Road in Liberty Twp.

Storm drain labels are simple and effective best management practices to prevent non-point source pollution from entering waterways in our community and those downstream. The stencils are intended to make urban and suburban homeowners think twice before dumping material down the storm sewers and into the rivers, streams, and ponds in their neighborhoods. Some common pollutants that people often unknowing introduce into local watersheds include oils and automotive fluids, antifreeze, paint, paint thinner, pesticides, fertilizers, pet waste, yard waste, dirt, and even the soaps and chemical cleaners used to wash their vehicles and siding.

The storm drain labeling program is conducted in partial fulfillment of one of six criteria goals set forth in the USEPA's National Pollutant Discharge Elimination System (NPDES) Phase II Permit for metropolitan areas with 100,000 or more people. The Permit holder for regulated townships in Butler County is the Butler County Stormwater District.

The initial reaction to the program and demand for labels has been outstanding. If you or your organization would like to assist with future labeling projects or if you would like to see storm drain labels in your neighborhood, please contact Joel Thrash at 513-887-3720. All materials required for label installation, including storm sewers maps and educational outreach pamphlets will be provided to any interested neighborhood.

Newspaper Article

JournalNews
SECTION C
Sunday
August 22, 2004
www.journal-news.com
LOCAL

County to label storm drains in effort to quell pollution

Statewide program targets citizens' pollution awareness

By Joshua Rinaldi
For the JournalNews

HAMILTON — Most water pollution is no longer coming from factories but from residents, says Joel Thrash, urban technician for the Butler County Soil and Water Conservation District.

"We're seeing more (pollution) from urban runoff and agricultural runoff," he said.

Urban runoff includes pollutants such as antifreeze, paint, chemical cleansers and yard wastes among others. People often unknowingly introduce such items into waterways by dumping them in drains that connect to waterways.

The problem has led to a statewide initiative that requires cities to label storm drains in an effort to make people reconsider what they are dumping, Thrash said.

"We're trying to make people think twice," he said.

Phase I of the initiative was put into effect a few years ago and regulated large cities such as Cincinnati. Now Phase II, which requires smaller municipalities to label storm drains, has begun.

"Phase II really struck the heartland of Ohio," Thrash said. He added that there were about 700 communities statewide involved with Phase II.

Thrash also said that Butler County is ahead of the game. To implement Phase II in Butler County, the Butler SWCD is collaborating with the Butler County Stormwater District for the project.

"We have an agreement with (Butler SWCD) to help us implement some of the activities," said Bob Lentz, storm water coordinator for the Butler County Stormwater District.

"The Stormwater District is collaborating with other county agencies to minimize cost," he said.

Butler SWCD will do the physical labeling while the Stormwater District will provide "anything they need to accomplish the project," Lentz said.

Thrash hopes to have about 300 storm drains labeled by the end of the year. He said the organization works with volunteers from subdivisions, in which the labeling is taking place.

"Rather than some 'Big Brother' coming over and stamping your storm drain, the people do it," Thrash said.

Most labeling work occurs on select Saturdays as a result of volunteers working during the week. Thrash expects the labeling initiative to continue into next year.

"We've got more subdivisions to do than we can do this year," he said.

For assistance with future labeling projects or questions about labeling, contact Thrash at (513) 887-3720.

APPENDIX VIII. Example Streamwalk Agenda

Elk Creek Stream Walk
Madison Jr. High School

Who: Madison Jr. High 8th Graders
When: Friday Oct. 8th 8:30 AM and 11:30AM
Where: Sebald MetroPark (Elk Creek Road just south of 122)
Why: To provide students with: *"An Interdisciplinary Potpourri of Local Science"*

Concepts Covered

- Elk Creek in Watershed Context
- Surrounding Local Land Use / Impacts
- Geologic Background
- Physical attributes and stream hydrology
- Biology and stream ecology
- Stream chemistry

Streamwalk Overview:

The Elk Creek and its watershed provide the residents of Madison Township with a wonderful educational resource and an insightful look into a number of scientific concepts and environmental conditions. The Butler SWCD intends to bring these insights to the forefront of students' minds through a challenging, yet entertaining, educational stream walk.

With over 130 students in the morning and afternoon, our traditional program of walking the stream channel will need to be curtailed to fit the needs of a large group of students. Our staff of five, in cooperation with 8th grade teachers from Madison Jr. High, will lead students through a series of stations set up along the stream that demonstrate key attributes to the subject material on hand. Our plan is to have five groups of roughly 12-15 students rotating every 20-25 minutes to each of 5 stations. Introductions will be made before breaking off into groups, and closing comments will be made to the entire group following the steam walk. Students in the morning session will be permitted to eat at the Butler Co. MetroPark shelters.

Stations

1.) Stream Ecology - Students will be able to use seines provided by our office to temporarily capture macroinvertebrates, fish, and other aquatic organisms. Our education specialist will help identify organisms and help assess the biological makeup of the stream and its floodplain. Students will be able to participate.

2.) Fossil Challenge – Students will be given background information on the present geology and geologic history of this region and SW Ohio in general. Past life forms can be found throughout this stream, and after a brief overview of Ordovician life, they will be given a challenge to find and identify some of these organisms

3.) Physical Attributes and Stream Flow Challenge – As described in many earth science texts, students will be taught the physical components of a meandering stream including the floodplain and its soils, point bars and cut banks, pools and riffles, substrate and hardpan, groundwater and surface water and more. Students will be given instructions and a challenge to calculate stream flow using only a yard stick, a tape measure and an orange- a useful experiment to demonstrate the interaction between math and science!

4.) Testing Water Quality – Students will be shown how to assess the environmental health of the stream using different types of indexes. A hands-on demonstration of testing water chemistry will be done with each group.

5.) The Watershed - Using maps and a demonstration, an understanding of the watershed concept will be achieved. Students will be able to delineate their watershed using available information, and this station will conclude by teaching the interaction between land use, upstream sources of pollution and water quality.

Note* Please make sure students bring old **tennis shoes and clothes that may get wet!*

AM GROUP		PM GROUP
8:30-8:35	Introductions and Elk Creek Background Info	11:30-11:35
8:35-8:45	Spilt large group into 5 groups and escort to each station	11:35-11:45
8:45-10:30	Streamwalk Stations (25 min a piece)	11:45-1:30

The Watershed Station
Testing Water Quality
Physical Attributes and Streamflow Challenge
Fossil Challenge
Stream Ecology

10:30-11:00 Lunch

#Note# Times can be subject to change depending on Madison Jr. High teacher/student schedules.

APPENDIX IX. Butler County Earth Moving Permit

Application Process

Erosion and Sediment Control Earth Moving Permit

Application

The ESC Earth Moving Permit Application can be downloaded (Adobe Reader is required). A copy of the permit application is also available from the Butler SWCD office located at 1810 Princeton Road, Hamilton, OH 45011. Please call (513) 887-3720 if you have any questions

Process and Fee schedule for Erosion and Sediment Control Earth Moving Permit

Step 1: Fill out Earth Moving Permit application and pay fee **(payable to Butler County Commissioners)** when turning in erosion and sediment control (ESC) plans (construction drawings) to the Department of Development and Planning.

-or-

The developer may submit an initial ESC plan directly to Butler SWCD w/ completed application and fee (payable to Butler County Commissioners).

This option assumes the anticipation of having a completed ESC plan by the time construction drawings are submitted to the Department of Development and Planning.

Step 2: Department of Development and Planning sends permit application and construction drawings to Butler SWCD for review by Urban Technician. Initial review comments will be returned to the developer within 14 calendar days

Step 3: Pre construction meeting with Urban Technician. Make any additional changes to construction drawings necessary and resubmit plans with revisions for approval.

Step 4: Receive Earth Moving Permit approval from the Butler SWCD.

Step 5: Begin earth moving according to approved plans

Step 6: Adhere to any request from Urban Technician from inspections during earth moving that are found to be in violation of Earth Moving Permit.

Step 7: Prior to recording of plat all erosion and sediment controls must be in place, functioning properly and approved by Butler SWCD.

*If earth moving begins without Earth Moving Permit approval the fee will be doubled and the site will not be recorded until fee is paid in full, application turned in and Earth Moving Permit is approved.

* Make Fee Payable to Butler County Commissioners; turn into the Department of Development and Planning or directly to the Butler Soil and Water Conservation District along with the ESC plans/ construction drawings and the Earth Moving Permit application.

Application

Butler Soil and Water Conservation District

Erosion and Sediment Control Earth Moving Permit Application
***(This is not NPDES permit)**

Subdivision, Residential	$75.00/disturbed acre (Min=$1000.00 Max=$5000.00)	_____
Subdivision, Commercial	$100.00/disturbed acre (Min=$2000.00 Max=$10000.00)	_____

Project Name:_____

Project Location:_____Total acres:_____

Acreage Disturbed:_____ Receiving Waters:_____

Owner:_____Phone:_____Fax:_____

Owners Address:_____

Site Contact:_____Phone:_____Fax:_____

Site Contact Address:_____

Engineer:_____Phone:_____

ESC Contractor:_____Phone:_____

Applicant Name:_____

Applicant Signature:_____Date:_____

Fee Paid:_____ **(Make payable to Butler County Commissioners)**

Return application and fee to: **Butler County Department of Development and Planning**
130 High St, 6th Floor
Hamilton, Ohio 45011

Permit will be issued upon review and approval of ESC construction drawing plans and permit application

Office Use Only

Application received:	_____
Construction drawings received:	_____
Revisions received:	_____
Preconstruction meeting completed:	_____
Approved:	_____
Permit issued:	_____

*A separate permit which authorizes discharges of stormwater from construction sites is also required by the Ohio EPA for projects which disturb more than one acre of ground. Contact Chris Cotton at OEPA's Southwest District office at 937.285.6442 or via email at chris.cotton@epa.state.oh.us.

BUTLER SOIL & WATER CONSERVATION DISTRICT
STORM WATER POLLUTION PREVENTION PLAN (SWPPP) CHECKLIST FOR CONSTRUCTION SITES

Project _____ NPDES Permit # _____
Location _____ Developer _____
Engineer_____ Contractor _____

Butler SWCD Fee: *Preliminary Plat* _____ *SWPPP*_____

General Requirements: An SWPPP (a.k.a. 'ESC Plan') must be developed and reviewed **before** construction activities commence. The NOI must be submitted at least 21 days prior to the start of any construction activity. The developer must notify the local government entity (Butler SWCD) that an NOI has been filed and must post a copy of either the NOI or the Ohio EPA Director's acceptance letter on site. The SWPPP must be retained on-site at all times during construction activity.

Minimum Standards: This plan must address all minimum components of the NPDES General Permit and conform to the specifications of the Ohio Department of Natural Resources Division of Soil and Water and Natural Resources Conservation Service handbook, Rainwater and Land Development (Rev. 2004).

ESSENTIAL COMPONENTS:

❑ **Vicinity Map**- Location map showing site in relation to surrounding area. Include location of receiving streams/surface waters.

❑ **Limits of Clearing and Grading Plan** - Indicate limits and show acreage of earth disturbing activity. Show borrow, spoil and topsoil stockpile areas. Include before and after contours with appropriate contour intervals. Delineate drainage watersheds, indicating acreage of each area.

❑ **Project Description** - Briefly describe the nature, purpose and scope of the land disturbing activity. This may be self evident from the plan. Include total area of site and acreages of individual phases if applicable. Include a narrative describing the overall erosion and sediment control scheme for this site.

❑ **Soils Information** - Show locations of bedrock, unstable, or highly erodible soils as determined by the Butler County Soil Survey and/or soil tests. Show location of any soil test borings on plan. Other soils information such as permeability, perched water table, etc. may be mentioned.

❑ **Surface Water Locations** - Show locations of all lakes, ponds, surface drainage patterns, wetlands, springs, etc. on or within 200 feet of the site. If storm water will be discharging into a municipal separate storm sewer system or into a storm water management structure such as a retention basin which is off the site, clearly indicate this on the plans.

❑ **Site Development** - show locations of all existing and proposed buildings, roads, utilities, parking facilities, etc.

❑ **Schedule of Construction Activity** - Included in this should be a schedule for implementing temporary and permanent erosion and sediment control practices and storm water management facilities. The NPDES permit requires that all sediment ponds and perimeter barriers be constructed within 7 days of first grubbing. All sediment control structures must remain functional until upland areas are stabilized.

❑ **Location of Practices** - Show locations of all structural erosion and sediment control, storm water management, and water quality practices, including post-construction best management practices. Water ponding facilities should be drawn to scale, with the area of the contributing watershed given.

❑ **Detail Drawings** - All structural practices should be explained with detail drawings of specifications. Installation specifications may also be necessary to aid contractor. Included should be outlet structures for retention, detention facilities and any special modifications to these structures to aid in improved sediment trapping capability.

❑ **Land Stabilization Measures** - Provide specifications for temporary and permanent seeding, mulching, blanketing, etc. and also installation schedule for each practice. The NPDES permit requires that all areas at final grade or where construction activity has temporarily ceased for 45 days or longer be stabilized within 7days of last activity. Erosion control blankets and matting should be used to stabilize channels where the flow velocity is greater than 3.5 ft./sec. steep slopes, on highly erosive soils and on areas slow to establish a vegetative cover.

❑ **Special Notes for Critical Areas** - Include pertinent information regarding stream bank stabilization, riparian corridors, buffer areas, stream restoration plans, wetland areas.

❑ **Existing Natural Areas** - Show existing or unusual vegetation, wetlands, springs, rock outcroppings, etc. Include vegetation to remain (trees, buffer areas, etc.).

❑ **Maintenance and Inspections** - Provide notes and information regarding maintenance of each practice to assure continued performance. Erosion and sediment control must be inspected once every 7 days and with 24 hours of 0.5" or greater rainfall. A written log of these inspections must become part of the SWPPP. This log should indicate the dates of inspection, inspector weather conditions, observations, actions taken to correct problems, and the date action was taken.

❑ **Storm Water Runoff Considerations and Post -Construction BMPs** - Show the pre- and post-construction runoff coefficients including information such as the method used to calculate runoff. Include a narrative describing post construction storm water management BMPs such as detention basins, grass filter strips or wetlands and show locations of all stormwater management facilities. Include vegetation to remain (trees, buffer areas, etc.)

❑ **Trap Efficiency, Location and Volume of Sediment Ponds** - These calculations must be shown for all temporary or permanent sediment traps/ponds and any retention/detention facilities to be used for this purpose. All ponds used for the purpose of trapping sediment must have a volume of 67 cubic yards per acre of total drainage area to the pond (***not*** *disturbed area*). Trapping efficiency of these structures must be at least 75%.

❑ **Disposal of Solid, Sanitary and Toxic Waste** - Solid, sanitary and toxic waste must be disposed of in a proper manner in accordance with local, state and federal regulations. It is prohibited to burn, bury or pour out onto the ground or into the storm sewers any solvents, paints, stains, gasoline, diesel fuel, used motor oil, hydraulic fluid, antifreeze, cement curing compounds and other such toxic or hazardous wastes. Wash out of cement trucks should occur in a a diked, designated area where the washings can collect and be disposed of properly when they harden. Storage tanks should be located in diked areas away from any drainage channels. The diked area should hold a volume 110% of the largest tank.

❑ **Off-Site Sediment Tracking** - Minimize such tracking of sediments by vehicles by making the use of gravel construction entrances and regularly scheduled sweeping/good housekeeping.

General Notes to Contractor: *(These are specific for Butler County and must be included on the plan)*

❖ Sediment Ponds/Traps and Perimeter Controls shall be implemented as a first step of grading and within 7 days from the start of grubbing and shall continue to function until upland areas are stabilized.

❖ TEMPORARY AND PERMANENT STABILIZATION - Disturbed areas which will remain unworked for a period of 21 days or more, shall be stabilized with seeding and mulching or other approved means within 7 days. All disturbed areas within 50 feet of an intermittent or solid blue line stream (as defined by USGS 7.5" Quadrangles) shall be stabilized within two (2) days. All areas of a site which are at final grade shall be stabilized with seeding and mulching or other approved means within seven (7) days.

❖Ditches with grades greater than 1.5% and all other slopes greater than 6% will have erosion control blankets/matting installed as part of stabilization measures.

❖Builder is responsible for erosion control on individual lot.

❖No solid or liquid waste shall be discharged into storm water runoff.

❖All erosion and sediment control practices must conform to the specifications of Rainwater and Land Development, Ohio's standards for Storm Water Management, Land Development and Urban Stream Protection.

❖Other erosion and sediment control items may be necessary due to environmental conditions.

❖Regular inspection and maintenance will be provided for all erosion and sediment control practices. Permanent records of maintenance and inspections must be kept throughout the construction period. Inspections must be made a minimum of once every 7 days and immediately after storm events greater than 0.5 inches of rain in a 24 hour period. Provided will be name of inspector, major observations, date of inspection and corrective measures taken.

A NOTE ABOUT SUBLOTS

For developments with sub lots, NPDES permit coverage must be maintained on the lot until it reaches final stabilization.

❖*If the developer will also build the structures within the development or opts to maintain permit responsibility on lots where structures are being built*, a detail drawing of a typical sublot indicating typical BMPs with notes specifying measures for critical areas, must be included in the SWPPP.

❖*If a developer opts to parcel off permit responsibility to the new lot owner once the lot is sold,* the new lot owner must submit an Individual Lot Notice of Intent at least 7 days prior to the transfer of title from the developer to the new owner. The developer must allow the new owner access to the developer's SWPPP. The new owner then must maintain and/or install any lot-specific sediment controls. *It becomes*
the new lot owner's responsibility to comply with the NPDES permit on his lot and to develop a lot site map indicating the location of BMPs.

THE BUTLER COUNTY ENGINEERS OFFICE (BCEO) WILL ASSUME RESPONSIBILITY OF ESC PLANS AND INSPECTIONS FOR INDIVIDUAL LOTS

APPENDIX X. Draft MOU with the Ohio EPA

Working Agreement
between the
Ohio Environmental Protection Agency
and the
Butler Soil and Water Conservation District
and the
Ohio Department of Natural Resources Division of Soil and Water Conservation

Introduction

The Ohio Environmental Protection Agency, the Butler Soil and Water Conservation District and the Ohio Department of Natural Resources Division of Soil and Water Conservation have agreed to establish a cooperative agreement for implementing a program to control soil erosion and sedimentation and to improve water quality from construction sites authorized to discharge storm water associated with construction activity under an Ohio Environmental Protection Agency (EPA) National Pollutant Discharge Elimination System (NPDES) storm water permit. It is recognized that the quality of Ohio's water resources is of vital importance to all Ohioans, and that urban development can significantly impact water quality. An approach that is will coordinated among these agencies will provide better oversight and technical assistance to those in the development and construction industry while decreasing unnecessary duplication.

Participating Agencies

The Ohio Environmental Protection Agency is the state agency delegated the responsibility for implementing the federal storm water program, including the NPDES permit program. Discharges of storm water from sites where construction activity is being conducted, as deemed in 40 CFR 122.26, are authorized by the Ohio EPA under a general or individual NPDES storm water permit in compliance with the provisions of the Federal Water Pollution Control Act, as amended (33 U.S.C. 1251 et. Seq.) and the Ohio Water Pollution Control Act (Ohio Revised Code Chapter 6111).

Butler Soil and Water Conservation District is a legal entity of the State of Ohio and have the responsibility to carry out a conservation program in our county. The power of the Butler Soil and Water Conservation District is established in Ohio Revised Code Chapter 1515. Butler Soil and Water Conservation District receives assistance from the Natural Resources Conservation Service (NRCS) and the Ohio Department of Natural Resources Division of Soil and Water Conservation and typically maintain close relationships with county and municipal government. Butler SWCD has a program that addresses natural resource problems in our county. Butler SWCD has a long history of providing technical assistance and education to individual land users and to local government regarding soil and water conservation issues.

The Ohio Department of Natural Resources (ODNR), Division of Soil and Water Conservation provides standards and specifications for best management practices which will abate erosion and prevent the degradation of waters of the state. The Division of Soil and Water Conservation also assists Butler SWCD in developing and administering our conservation programs.

Therefore, this working agreement is entered into by the authority of the Ohio EPA, ODNR Division of Soil and Water Conservation, and the Supervisors of the Butler Soil and Water Conservation District in order to promote better compliance with the NPDES storm water permit for construction activity.

The Ohio EPA agrees to:

1. Provide technical and educational assistance to aid the regulated community to comply with the NPDES storm water permit requirements.

2. Inform Butler SWCD of NPDES storm water program procedures and policies, including names of Ohio EPA contact persons.

3. Distribute monthly updated lists of Notices of Intent and Notices of Termination received for coverage under the NPDES storm water permit for construction activity to the Butler SWCD and to the ODNR, Division of Soil and Water Conservation.

4. Obtain Storm Water Pollution Prevention Plans (SWPPP) for the Butler SWCD in cases where access to the SWPPP has been denied.

5. Participate in joint site inspections as necessary, and to communicate and coordinate planned site inspections with the Butler SWCD

6. Assume leadership in responding to sites where no compliance progress can be obtained.

7. Utilize the documentation established by the Butler SWCD to enforce requirements of the NPDES storm water permit for construction activity.

Butler SWCD agrees to:

1. Conduct educational programs on erosion and sediment control and storm water management on construction sites in coordination with the Ohio EPA.

2. Work with landowners, developers, engineers, and contractors prior to construction regarding the general requirements of the NPDES Storm Water Permit for applicable construction projects as staff is available.

3. Provide a plan review and site inspection program, with all of the following components:

   -requesting, review and provide recommendations regarding SWPPP plans
   -inspecting sites for proper implementation of best management practices
   -working with the owner or developer to obtain compliance with permit requirements
   -giving technical assistance and information to improve implementation of practices

4. Maintain documentation of site inspections and plan reviews and report cases of noncompliance to the Ohio EPA.

ODNR Division of Soil and Water Conservation agrees to:

1. Make available current technical standards and specifications for improving water quality from construction and development sites, including standards and specifications developed by the Natural Resources Conservation Service.

2. Provide technical support and training for Ohio EPA and Butler SWCD staff regarding erosion sediment and storm water controls.

3. Assist Ohio EPA and Butler SWCD staff as necessary and available in plan reviews and site inspections.

It Is Mutually Agreed by All to:

1. Participate in regularly scheduled meetings to exchange information and become acquainted with new staff.

2. Cooperate in enforcement cases.

3. Work to remove duplication and confusion in policies and procedures.

4. Participate in regular education and training programs designed to inform those in the construction and development industry about water quality, and the implementation of sediment, erosion and storm water management controls at construction sites.

5. Develop and provide educational materials for use by developers, engineers and contractors.

6. Work to avoid unnecessary duplication in plan reviews and site inspections.

7. Recognize that obligations of the State are subject to the Ohio Revised Code 126.07.

In witness whereof, this agreement is executed and agreed to on the day, month, and year:

Butler Soil and Water Conservation District

Signed:_____
Chairperson, Board of Supervisors

Date: _____

Ohio Environmental Protection Agency

Signed:_____

Date: _____

Ohio Department of Natural Resources, Division of Soil and Water Conservation

Signed:_____

Date: _____

Speakers

Joe Allen	President, Nathaniel Development Co.
Dan Donaldson	Administrator, Lake Soil and Water Conservation District
Chris Cotton	Stormwater Coordinator, Ohio EPA
John Mathews	Urban Stormwater Specialist, ODNR Division of Soil and Water conservation
Rod Tyler	Filtrexx Corp.

Outside Product Exhibits - Adjacent to Demonstration Area

ADS	Alpine Stormwater
Bobcat	Contech
Caterpillar	CPESC, Inc.
Cinti Wholesale Supply	Duracrete
Dandy Products	Enviroscape
Ernst Conservation Seeds	
Erosion Runner Ohio	Evans Landscaping
Filtrexx	Finn
Fleximat	Green Velvet Sod Farm
HANCOR	Henderson Turf Farm
Hutzel Landscaping	LANDCORP
John R. Jurgensen Co.	Merideth Bros.
Melvin Stone Co.	Midwest Supply
OUPS	Pavestone
PS Construction Fabrics	
Shamrock Materials	Site Supply
Unilock	Valley Asphalt Co.
Village Rental	Vortec

Warren County Career Center
3525 N. St. Rt. 48
Lebanon, Ohio 45036

SOUTHWEST OHIO
SEDIMENT AND EROSION CONTROL

FIELD DAY

Thursday, June 3, 2004
7:30 a.m. to 1 p.m.
Warren County Career Center
3525 N. St. Rt. 48 - Lebanon, Ohio
see www.wccareercenter.com for map

Landscapers, Contractors, Excavators, Bidders, Job Foremen, Home Builders, Inspectors, Public Officials

- NPDES Phase II Information
- Erosion and sediment control practices
- Silt fence installation
- Alternatives to silt fencing
- Properly installed Ditch Checks, Sediment Traps
- Properly installed De-watering Risers
- Mulch and Hydroseeding
- Talk with product manufacturers
- Explore the latest equipment.
- “Best Management Practices”
- Hands-on, up-close and informative
- Fun door prizes!

Southwest Ohio Sediment and Erosion Control Field Day

Warren County Career Center
June 3, 2004

Sponsored by:
Soil & Water Conservation Districts in Southwest Ohio
Warren County Career Center
Water Management Assoc. of Ohio
Miami Conservancy District
Upper Little Miami and Caesar Creek Watershed Project

Agenda

Conference will be held in the Commons Area of the Warren County Career Center

7:30 a.m.	Registration - Coffee
8:00 a.m.	Welcome - Dave McElroy
8:15 a.m.	How Streams Function - John Mathews
8:45 a.m.	EPA update - Chris Cotton
9:15 a.m.	A Developer's Perspective - Joe Allen
9:45 a.m.	Enforcement Programs - Dan Donaldson
10:15 a.m.	Brunch
10:30 a.m.	Using Compost for Effective Storm Water Management and Erosion Control - Rod Tyler, Filtrexx Corp.
11:00 a.m.	Outdoor Demonstrations
1:00 p.m.	Adjourn

Outside Demonstrations:

20 to 30 minutes each

- Silt Fence Installation Competition
- Hydroseeding
- Compost Logs Filling and Laying
- BMP Tour - Erosion and Sediment Control
  - Ditch Checks
  - De-Watering Riser
  - Inlet Protection
  - Mulch Cover
  - Outlet Protection

Plus: Outside Product Exhibits

(listed on back panel)

Registration (copy this sheet or cut) and mail to:

Attn: Adult Education
Warren County Career Center
3525 N. St. Rt. 48
Lebanon, Ohio 45036
513-932-8145 ext. 5323
www.wccareercenter.com

Name _____

Company Name or Title_____

Address _____

_____

Phone ( )_____

Fax ( )_____

E-mail_____

Cost: $30, includes brunch, T-shirt and Door Prizes

Attach check
Make checks payable to:

Warren Co. Career Center, Adult Education

Registration deadline: May 21, 2004
Space is limited. Reservations will be held on a first received basis, so early registration is recommended.

APPENDIX XII. Urban Developments Newsletter

Butler Soil & Water Conservation District

Urban Developments

For Developers, Contractors, and Engineers

A Bi-Annual publication by the Butler Soil & Water Conservation District

Issue 1 **Volume 1**

New News!

Butler SWCD will be publishing a bi-annual newsletter to update the urban community on 'hot topics' and issues related to resource protection/ conservation. The newsletter's goal is to provide the development community with tips and guidance on soil and water resource protection for present and future projects.

Super Soil Stopper Award

Each month in 2005, the Super Soil Stopper Award will be presented to the construction site which best controls erosion and storm water runoff. The award's slogan is *"Where the green grass grows and clear water flows!"*

January's recipient is the Sanctuary Development located in Liberty Twp. Congratulations to Tri-State Land Development (developer) and Mt. Pleasant Contractors (contractor).

Butler SWCD

Jennifer Deaton,
Urban Specialist
Joel Thrash
Urban Technician
1810 Princeton Road, Hamilton, OH 45011
(513) 887-3720
www.butlercountyohio.org/conservation

What's New?

It's 2005 and the New Year has already brought some exciting changes as well as challenges to the Butler SWCD Urban Division. As you know by now, our new Earth Moving Permit is up and running. A printable version of the application and Stormwater Pollution Prevention Plan (SWP3) checklist can be found on our website. We are energized to provide an increased level of technical assistance to all of our engineers, developers and contractors. In addition to our reviews and inspections, **please** use the resources we can provide you from conservation-designed subdivisions to stream restoration and bank stabilization! Also be sure to attend our other sponsored events such as the upcoming "Water Quality Basin" workshop in May and our bigger and better 2005 ESC Field Day on June 7th. For all inquiries, please call (513) 887-3720.

What constitutes a 'Stream' in Butler County?

Stream in Fairfield Falls Subdivision in Fairfield Twp.

One of the most ambiguous concepts facing developers, engineers, contractors, and even government officials is the definition of a 'stream'. This ambiguity is not limited to Butler County. It's a definition that has been debated by regulators as well as lawmakers and redefined by federal judges as recently as 2002 (US 6th Circuit Court of Appeals). The implications of having a defined 'stream' on your site has far reaching effects from the pocketbook, to paperwork, to the location of storm water basins and the timing of construction activity. Obtaining Army Corp (§404) permits and Ohio EPA (§401) water quality permits can halt a project for several months, forcing the site owner to sit on the interest of their loan. In many instances our streams are indeed resources worth protecting for reasons such as the stream's interconnectivity to groundwater (e.g. drinking water) deposits, flood control, watershed water quality and biological habitat, or aesthetic value to name a few. Nonetheless, situations still arise where 'streams' appear to the naked eye as worthless farm ditches or meaningless drainage swales.

Current definitions & common misconceptions

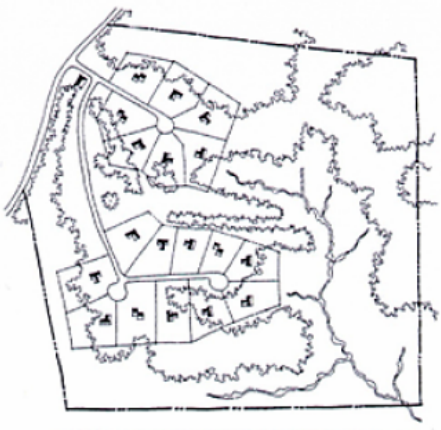
Butler County regulations define a stream as a solid blue line (perennial) or dotted blue line (intermittent) on the USGS 7.5' quadrangles that were created decades ago. Even more confusing the US Army Corps of Engineers (USACE) definition is so broad it potentially includes any drop of water that does not evaporate or infiltrate into the ground. Depending on the USACE District, this definition is interpreted in a different way. Butler County falls under the Louisville District, which tends to have a more conservative approach limited to larger streams. The OEPA goes beyond navigation and flood control and into the realm of habitat and water quality protection. They classify streams in three categories: perennial, ephemeral, and headwater, a system much more complex and inclusive than simple blue lines. A common misconception among private entrepreneurs and local regulators are that the local regulations apply. However, when dealing with natural resources in the US, state and federal authorities always trump local units of government. And, keep in mind; the most stringent regulations always apply!

Who owns Butler County streams?

The Ohio and United States Constitutions' do not address this question, nor has there ever been a statute enacted to address it. In situations where no statutes exist, the answer is derived from common law.

Water is a "public good" and can not be owned as private property; however, the land under the stream belongs to the landowner. Landowners do have 'riparian rights' to make use of the water flowing through their property, so long as the rights of others downstream are not infringed upon. For the purposes of development, we should be aware that the implications of common law may still apply despite compliance of the Clean Water Act and its NPDES and 404/401 Permits. Even with the appropriate permits, actions like piping/altering streams and inline detention should be carefully designed and avoided whenever possible for the sake of liability.

What criteria does Butler SWCD use when reviewing/commenting on plans?



CONSERVATION DEVELOPMENT LAYOUT

The answer to this question is simpler than you might think. Obviously, large perennial waterbodies like the Great Miami River and Gregory Creek or Mill Creek are resources worth protecting and designing around. Other streams that show up on USGS topographic maps as solid or dotted blue lines (like Hunts Cr. or Panther Run) also fall under CWA regulation if they are altered in any way. Within those watersheds, numerous tributaries are indeed water resources; most notably for the hydrologic significance they have within the system and beneficial water quality and habitat they provide to the overall watershed. These streams will be identified by our office during the review process, and if necessary, referenced to the appropriate regulatory agencies to make a final decision. The best way to identify these streams ahead of time (and avoid/minimize delays) is to have your engineering firm or environmental consultant survey the stream by performing some kind of evaluation. Two options are the Headwater Habitat Index (HHEI) or Qualitative Habitat Evaluation Index (QHEI), both of which can be found at the Ohio EPA's website or by contacting our office. Simply scoring and ranking questionable streams ahead of time will determine when permits need to be obtained or mitigation efforts should be taken.

Our office is here to help, so please use us. We understand many hurdles involved with developing property, but we cannot emphasis enough how important it is to plan ahead and design/construct around natural resources like streams or wetlands. The **most absolute way to avoid** hassles is simply to avoid construction in the riparian zone, the areas in the stream and surrounding its floodplain.

PLEASE CONTACT THE BUTLER SWCD IF YOU WISH TO HAVE YOUR NAME REMOVED FROM OUR MAILING LIST

BUTLER SOIL AND WATER CONSERVATION DISTRICT
1810 Princeton Road
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Web: www.butlercountyohio.org/conservation

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