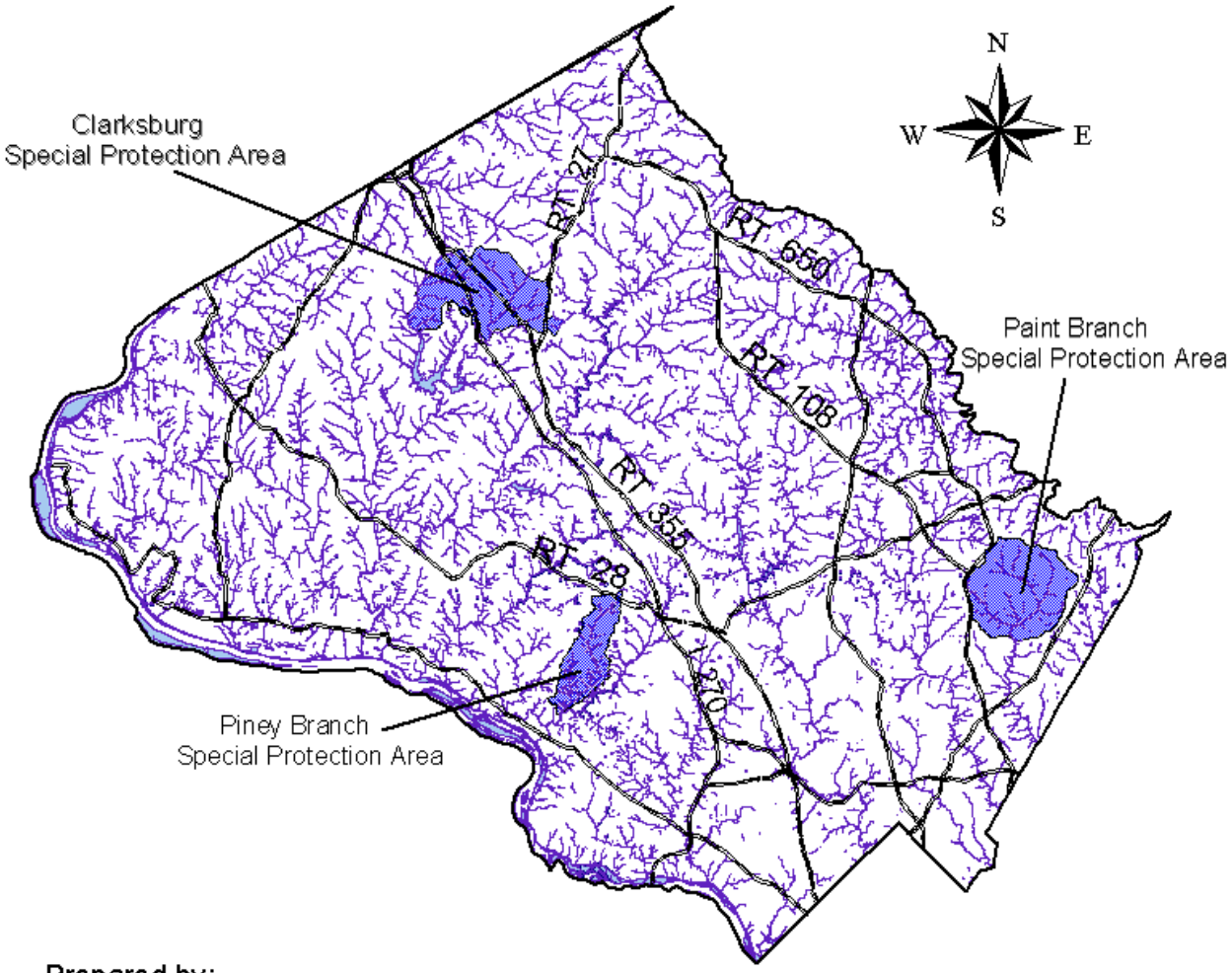
Montgomery County Special Protection Area Program
Annual Report - May 2001



Prepared by:

Department of Environmental Protection

Department of Permitting Services

In Cooperation with:

Maryland - National Capital Park and Planning Commission

SPECIAL PROTECTION AREA PROGRAM
2000 ANNUAL REPORT

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1.0 Executive Summary

Purpose of the Report: The Special Protection Area Program was established by Montgomery County Code Chapter 19, Article V (Water Quality Review-Special Protection Areas, Section 19-67). That Section of the County Code was implemented by Executive Regulation 29-95, "Water Quality Review for Development in Designated Special Protection Areas". Those regulations require an Annual Report be prepared. The report summarizes and analyzes available results of stream and best management practices (BMP) monitoring data collected within SPA's. The Report is to be submitted to the County Executive and County Council with a copy to the Planning Board. This is the fifth report on the program. The first report covered the period 1994 through 1995. This report covers 2000.

Existing SPA's: The County Council has designated three areas within Montgomery County as Special Protection Areas (Figure 1). These areas have high quality stream systems in need of protection measures beyond current standards. These protection measures are necessary to ensure that the stream systems are protected to the greatest extent possible from the impact of master planned development activities. The designated areas are: the Clarksburg Master Plan SPA, the Upper Paint Branch Watershed SPA, and the Piney Branch Watershed SPA.

SPA Development Review Process: The SPA program requires the Montgomery County Department of Permitting Services (DPS), the Department of Environmental Protection (DEP) and the Maryland-National Capital Park and Planning Commission (M-NCPPC) to work closely with project developers from the outset of the regulatory review process to minimize impacts to SPA stream conditions. SPA permitting requirements guide the development of related concept plans for site layout, environmental buffers, forest conservation, site imperviousness, stormwater management and sediment control. A pre-application meeting presents the project developer with the critical natural resource parameters that need to be maintained in order to protect existing high level stream conditions. Protection of these natural resource parameters is guided by performance goals developed for each development project. Successful incorporation of the performance goals into the site design process requires innovation and close coordination between the project's design team and environmental, regulatory and planning agencies.

Status of the Stream Monitoring Program: DEP has been monitoring the streams in all three existing SPA's since 1995. Presently, DEP is collecting monitoring data at a total of 34 baseline SPA monitoring stations. Fifteen (15) additional stations have been established for the purpose of monitoring development impacts in certain localities. These forty-nine (49) stations include twenty-two (22) stations in the Clarksburg SPA, seventeen (17) stations in the Upper Paint Branch SPA, and ten (10) stations in the Piney Branch SPA. Baseline stations are monitored for the cumulative health of the stream. Changes in the structure and function of the fish and benthic macroinvertebrate communities are assessed and compared to alterations in the physical habitat of the stream.

Analysis of monitoring data has allowed the characterization of baseline conditions in the three

SPA's. In general, the biological stream communities in the SPA's have exhibited good to excellent quality stream conditions, relatively unimpacted by flow, sediment, or pollutant stressors. The stream channels are generally stable, with an abundance of quality habitat features necessary to maintain the biological community. 2000 data indicates slight declines in fish communities in all three SPA's which we attribute to lingering effects of drought conditions. Extreme drought conditions were experienced throughout the region during the summer of 1999. The benthic macroinvertebrate community throughout Paint Branch declined slightly in 2000 which is also attributable to drought conditions in 1999. Piney Branch macroinvertebrate samples collected in 2000 continued for the second consecutive year to indicate a decline in water quality throughout the mainstem of Piney Branch. The cause of this situation is uncertain at this point. DEP plans further research into this question in 2001. Most benthic macroinvertebrate samples collected in 2000 from Clarksburg SPA are yet to be analyzed. This will be done in 2001.

Status of SPA Conservation Plans: The Clarksburg SPA Conservation Plan was completed in May of 2000. Conservation Plans for all three SPA's are now available online at http://www.co.mo.md.us/services/dep/publications/home.html. These plans are based on the results of the five years of stream monitoring conducted by DEP, and other credible stream monitoring data. SPA conservation plans identify those natural resource parameters that must be protected within each SPA subwatershed to achieve and maintain a high level of water quality. The Plans provide additional technical guidance to assist in the preparation of site specific performance goals for new development or redevelopment projects.

Status of BMP Monitoring Plans: SPA development projects that include best management practices (BMP's) as part of their approved water quality plan are required to monitor the effectiveness of those BMP's. Monitoring plans are designed to gage the effectiveness of BMP's in managing stormwater and protecting water quality. Results are used along with stream monitoring data to evaluate the effectiveness of BMP's. There are currently 82 projects in various stages of the development process that are located within SPA's (Tables 1 & 2). About half of these will be submitting monitoring data. Most projects not submitting data were exempted from the monitoring requirement because of their small size. According to County Code, projects in Piney Branch and Clarksburg SPA's can be exempted from SPA requirements if they meet particular criteria. Projects on property zoned for agricultural, residential, or mixed use that contain a proposed impervious area of less than 8% of the total land area covered by the development approval application can be exempted. Projects with agricultural, residential, or mixed use zoning that have a cumulative land area of 10 acres or less, and a proposed impervious area of less than 15% of the total land area covered by the development approval application can also be exempted. Projects on property zoned for industrial or commercial use that consist of a cumulative land area of 2 acres or less covered by the development approval application similarly are eligible for exemption. In the Upper Paint Branch SPA all land disturbing activities are subject to SPA requirements. Although not exempted from the SPA requirements, some small projects are not required to conduct BMP monitoring if their small size makes monitoring impractical. Also, some projects predate SPA requirements. Other projects have not yet reached the sediment control plan approval stage that triggers BMP monitoring requirements. BMP

monitoring data has been received on nineteen (19) projects thus far. There are seven projects with approved BMP monitoring plans that have completed construction.

Table 1. SPA Development Projects As Of February 2001

	Projects in pre-application or plan review phase		Projects with approved plans not required to monitor BMPs		Projects with approved BMP monitoring plans	
	# of projects	**Acreage**	**# of projects**	**Acreage**	**# of projects**	**Acreage**
Clarksburg SPA	10	1338.7	6	115.78	6	540.7
Paint Br. SPA	4	63.63	19	51.68	9	375.45
Piney Br. SPA	3	17.0	13	538.23	12	382.48
TOTAL	**17**	**1419.33**	**38**	**705.69**	**27**	**1298.63**

Table 2. Status of Projects With Approved BMP Monitoring Plans As Of February 2001

Project Status	Clarksburg	Paint Br.	Piney Br.	Total
Pre-construction Phase	2	3	3	8
Under Construction	4	3	5	12
Construction Completed	0	3	4	7
Total	6	9	12	27

Supplemental Habitat Restoration and Stormwater Retrofit Measures: DEP is pursuing separate capital project initiatives in the Upper Paint Branch and the Piney Branch SPA's to improve the management of runoff from previously developed areas and mitigate isolated pockets of habitat damage that had occurred before the SPA program was established. These projects are intended to supplement improvements in watershed management achieved through the SPA permit process. In the Upper Paint Branch watershed, DEP has worked closely with the M-NCPPC and other agencies to inventory some 75 potential stream habitat restoration, wetlands creation, and stormwater retrofit project opportunities. Some of these are capital projects. Others involve small habitat restoration and wetlands and tree plantings that can be partially implemented by volunteers. DEP has actively involved the public in reviewing these projects and presently has 6 projects already completed. Ten (10) more are under design. In the Piney Branch SPA, DEP has inventoried a limited number of project opportunities for small wetlands creation, habitat restoration and stormwater retrofit projects located on the site of the Life Sciences Center in the uppermost portion of the watershed.

Next Steps: Since 1995, Montgomery County's regulatory and planning agencies have worked

cooperatively, to fully implement the different provisions of the Special Protection Area Program. Now that more projects are proceeding into actual construction, future annual reports will have a greater focus on analysis of development impacts and BMP effectiveness. Currently there is a limited amount of data that allows comparison of conditions at a site before, during and after construction. More data of this sort should become available soon as some of the SPA development projects currently under construction are completed. Although only a limited amount of data is available as yet, some initial results indicate that BMP's can limit the effects of development on stream conditions.

SPA regulations specify that structural BMP monitoring is to be done at all development sites where a water quality plan is required. Some sites are exempted due to their small size. Implementation of the BMP monitoring requirement has been somewhat problematic in that it is very difficult to apply equitably at all sites. DEP and DPS staff feel that a fee system would be more equitable and would yield better data on performance of BMP=s. This would mean that BMP monitoring is not done on every development project but rather only on those that, due to site layout and BMP design, would provide more opportunity to gain valuable information on performance of BMP=s. DEP and DPS plan to review the SPA regulations during the upcoming year and propose a BMP monitoring fee system be created.

Other Observations: Some other informal observations by DEP, DPS and M-NCPPC staffs indicate some preliminary benefits of the SPA program:

- oProtecting wide environmental buffers as natural, undisturbed areas is an important design objective on new development in the SPA=s.

- oSeveral project proposals that have gone through agency review and approval, include established forested planting areas earlier in the development stages of the projects.

- oMinimizing impervious surfaces has become an important design objective in development projects, especially in the Upper Paint Branch SPA, where a specific imperviousness cap is required by an environmental overlay zone.

- oMNCPPC and DEP have completed a model that predicts the effect of development on existing stream conditions. The model currently is not adjusted to account for SPA level BMP effectiveness in mitigating development impacts to receiving streams. Although developed for the Potomac Master Plan area, the use of county-wide stream data allows the model to be applied in other areas of the County. As SPA BMP monitoring data becomes available, the model will be re-calibrated.

- Encroachment on public lands has been identified as a problem affecting water quality in some portions of Paint Branch. This encroachment results in disturbed stream buffer areas. Increased enforcement of public rights and criminal statutes will be targeted at these areas to correct this problem. Restoration projects will also be examined as potential aids in remedying the situation.

- Some areas in the Clarksburg SPA have been identified where water quality is impacted by poor stream buffer areas. One large area where development is not yet planned may be an appropriate candidate for Maryland=s Conservation Reserve Enhancement Program (CREP). DEP will provide information on CREP to the property owner(s) and suggest they contact the county Soil Conservation District to discuss the program and its benefits.

MONTGOMERY COUNTY SPECIAL

PROTECTION AREA

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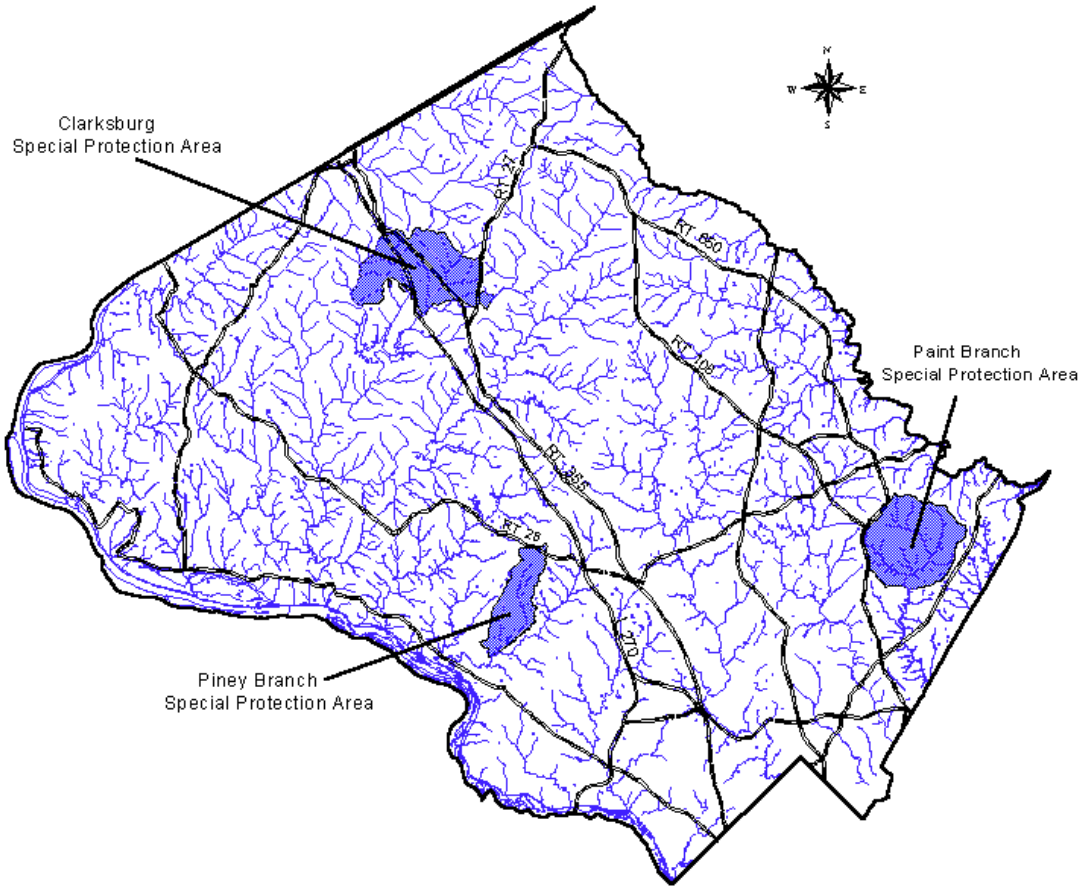


Figure 1. Montgomery County Special Protection Areas

2.0 Synopsis of the Special Protection Area Program

The Montgomery County Council established the Special Protection Area (SPA) program in 1994. The program was established to protect streams with existing high quality. It also was established to protect sensitive environmental resources related to water quality. The program focuses on protecting those streams and environmental resources where they are potentially threatened by proposed land uses. To date, the County Council has designated three regions as Special Protection Areas (Figure 1). They are the Clarksburg Master Plan SPA; the Upper Paint Branch Watershed SPA; and the Piney Branch Watershed SPA. Protection of existing high quality stream conditions is to be accomplished by closely coordinating water quality protection measures with land use controls. There are special requirements for developing land in an SPA and developers are required to work closely with the County government throughout the development process. Particularly significant is the requirement that developers consult with the county early in the process of generating a development plan. This approach seeks to ensure that protection of critical natural resources is incorporated into site design before significant time and fiscal resources are invested in any particular development scheme. When protection of identified critical natural resources is not considered in the early stages of preparing a development plan, opportunities for protection are not fully achieved and resources may not be fully protected. The process also provides opportunities for public involvement throughout the review process. Finally, the SPA program involves a monitoring component. Monitoring is intended to document stream conditions, stormwater management best management practices (BMP) effectiveness and allow environmental quality goals to be set and performance evaluated for development projects in SPA=s. Readers desiring more detailed information on the fundamentals of the SPA program should look to Appendix 1 of this document, AExplanation of the Special Protection Area Program.@

3.0 Implementation of the SPA Program

3.1 Review of Process to Date

The SPA program requires that water quality concerns be identified and addressed early in the planning process. Consequently, an integral component of the program is the requirement that developers meet with County staff before significant resources have been invested in planning the development of a site. This allows identification of sensitive areas that must be protected. Guidance on what should be included in a water quality plan for development of the particular site is also provided early on. Ideally, the goals and objectives presented in these early meetings are incorporated into the development site design plans.

At some SPA sites however, the complexity and intensity of conflicting development activities makes water quality goals difficult to achieve. In areas of intense development, there is a tendency by those involved in the site design process to focus on advance site planning. This advance site planning makes achievement of a constructive balance between development and water quality a daunting challenge. Complex advance site planning before County review may

preempt implementation of some of the more desirable options for water quality protection. In these situations, intensive site planning may inhibit full attainment of water quality performance goals. DEP and DPS will continue to work closely with the MNCPPC to input environmental protection considerations earlier into the site planning process.

3.2 Public Involvement in the SPA Program

As part of the SPA regulations, provisions are included that allow for public input to the water quality plan review process. The Department of Permitting Services (DPS) provides written public notice in the M-NCPPC Planning Board Agenda that preliminary water quality plans for a project have been submitted for review and approval. Public information meetings may be requested in writing within fifteen days of the notice being issued. At these meetings members of the public or interested organizations are briefed on submitted plans and can contribute comments if desired. In the last year, there have been few requests for public information meetings on projects undergoing the SPA plan review and approval process. However, there have been several informal water quality plan review meetings with DPS staff and interested community members. The public can also comment and testify when plans are reviewed and acted on by the Planning Board in public hearings.

The Montgomery County Council enacted legislation on October 3, 2000 which will ensure that purchasers of property in an SPA are aware of the program and its implications. The intent of the legislation is to promote awareness and comprehension of the goals and objectives of the SPA program, and of the effect the program may have on the use of a particular property for sale within an SPA . Council Bill 24-00 requires certain disclosures be made to all buyers of real property located in the special protection areas. The requirement applies to all real property sales contracts.

Buyers seeking further information are directed to the web sites of the three agencies responsible for SPA implementation for answers to the most often asked questions. These sites include telephone numbers to call for additional information. Buyers are also be directed to check their particular record plat and other land records and regulatory approval conditions to determine the existence of any regulatory restrictions such as conservation easements on their property.

3.3 Status of SPA Conservation Plans

Conservation plans for all three SPA=s are available. These conservation plans detail findings from several years of monitoring in the SPA=s and identify critical natural resources parameters that need to be protected if a high quality stream ecosystem is to be maintained. Performance goals for the protection of critical natural resources are established for each SPA. The conservation plans are intended to provide guidance for County plan reviewers in working with developers to establish performance goals for individual projects as required in the water quality plan. These conservation plans are Aliving documents@ intended to present the best available data on critical

natural resource parameters. As new cost effective and proven technology becomes available to better describe these natural resource parameters, the conservation plans will be updated as needed.

The conservation plans can be downloaded from the Montgomery County Department of Environmental Protection=s web site. The address is http://www.askdep.com. On the DEP homepage, click on publications, scroll to the blue box that contains the links to the three conservation plans. Previous SPA Annual Reports can be downloaded here as well.

3.4 Status of BMP Monitoring

Monitoring plans have been approved as part of preliminary and final water quality plans in each of the three SPA=s. Monitoring has begun on twenty-seven (27) projects to determine baseline conditions prior to development. Twelve (12) of these projects have begun construction and are now generating data on the impacts of construction activities. Seven (7) projects have been initiated and completed that required BMP monitoring. BMP monitoring data is summarized in Tables 6, 9 and 12 . There has not yet been an opportunity to monitor projects in a way that establishes a preconstruction baseline and continues into the post-construction period. This means that we are as yet unable to compare baseline conditions with conditions after construction to draw conclusions as to BMP effectiveness. As these sites progress to the post-construction phase, more information will become available. Current data allows us to compare baseline conditions with conditions during the construction process. This can provide information on the ability of erosion and sediment control BMP=s to minimize sediment impacts on stream channels. Initial, but thus far limited, monitoring results indicate that erosion and sediment control BMP=s are acting to minimize water quality impacts during construction. Sections 4.1.3, 4.2.4 and 4.3.4 discuss the BMP monitoring information obtained to date in the three SPA=s.

3.4.1 Anticipated Effects of BMP=s

Best management practices are intended to minimize development impacts on streams. While the ideal goal is for development to cause no impact to SPA streams, realistically some impacts are likely to occur. Impacts are most likely to be seen while construction activities are underway. After construction is completed, it is anticipated that carefully planned BMP's will allow streams to gradually recover. This recovery may take place over a period of several years. For this reason, water quality plans for SPA development projects usually require three to five years of BMP monitoring after construction of a project has been completed. The degree to which stream systems will be able to regain preconstruction conditions after development is uncertain at this point. Hopefully, SPA streams will be able to fully recover from any decline in conditions that might occur during construction. However, when other land use goals take precedence over water quality goals in the development of a site, the prospect of complete stream recovery becomes less clear. This is because stormwater controls cannot fully mitigate impacts on stream hydrology related to peak runoff increases and baseflow decreases. Therefore, as overall watershed imperviousness increases BMP effectiveness tends to decrease.

3.4.2 Outlook for Future

In the next few years, a number of development projects will be completed and post-construction monitoring data will become available. Cavenaugh, Peters, Boverman and Bruck projects in the Piney Branch and Briarcliff Manor in Paint Branch SPA will probably be among the first to be completed. Some of these projects may be completed by the end of 2002, depending on the housing market. Once we begin to get post-construction data, we will begin to gain a better understanding of how well the SPA program and associated BMP requirements are doing in minimizing development impacts. We will also be able to gage the degree to which impacted streams are able to recover from development activities in the SPA=s. The time required for recovery from development impacts should also be better understood. Ultimately, the intent of the SPA program is to offset changes to stream hydrology and quality caused by watershed development to mimic pre-development hydrology and maintain environmental quality. In the next several years we will be better able to gage the success of the program in that regard.

3.4.3 BMP Monitoring Methods and Procedures

To insure consistency and accuracy of monitoring techniques, DEP and DPS established the BMP Monitoring Work Group. This group, which consists of water quality professionals from the public sector and private industry, has established protocols for most types of monitoring being used to determine the effectiveness of BMP=s. This document, *Montgomery County Department of Environmental Protection Best Management Practice Monitoring Protocols*, June 1998, is available on the web at: http://www.askdep.com. The BMP monitoring workgroup will meet periodically to review effectiveness of the BMP monitoring protcols.

3.5 Status of Stream Monitoring Program

In the Fall of 1994, DEP began SPA baseline stream monitoring in Little Seneca Creek and Ten Mile Creek within the Clarksburg Master Plan SPA. In the Spring of 1995, in anticipation of SPA designation, DEP initiated further SPA baseline stream monitoring in the Upper Paint Branch and Piney Branch Special Protection Areas. Presently, DEP is collecting monitoring data at a total of 34 baseline SPA stations. Monitoring is also conducted at 15 development related stations. These stations include twenty (22) stations in the Clarksburg SPA within the Little Seneca Creek and Ten Mile Creek watersheds, seventeen (17) stations in the Upper Paint Branch SPA, and ten (10) stations in the Piney Branch SPA.

Monitoring at each station consists of the collection and identification of benthic macroinvertebrates, the collection and identification of stream fish, the collection of stream channel and flow measurements, the assessment of stream habitat and the collection of physiochemical water quality data in conjunction with the macroinvertebrate and fish collections. Water quality parameters measured include dissolved oxygen, temperature, pH, and conductivity.

3.5.1 Stream Monitoring Methods and Procedures

The Department of Environmental Protection established a Biological Monitoring Work (BMW) Group consisting of local and state environmental agency personnel, consultants, environmental organizations and citizens. One of the BMW Group's initial functions was to peer review and evaluate County stream monitoring protocols developed by DEP. These stream monitoring protocols are used for all County stream monitoring efforts, including SPA baseline monitoring.

Biological monitoring (fish and benthic macroinvertebrates) is the principal means by which stream condition is tracked over time as development proceeds in the SPA-s. Monitoring results from each year are used to calculate an Index of Biological Integrity or IBI (see glossary for definition). Reported in this document are all IBI scores from various locations within each SPA.

Measurements of stream habitat, water temperature and channel morphology assess the quality and stability of stream habitat. Long-term monitoring of these parameters will allow DEP to determine if changes to channel morphology are a result of natural variability or development induced stressors. Understanding where changes in channel morphology have led to degraded stream channels will also help in terms of knowing where stream restoration is needed.

4.0 Status of Individual Special Protection Areas

4.1 Clarksburg Master Plan Special Protection Area

The Clarksburg Area Master Plan, adopted in June of 1994, approved the creation of the first SPA. Based on the environmental analysis for the Clarksburg Master Plan, and guidance provided from the Maryland Department of the Environment and Maryland Department of Natural Resources, portions of Little Seneca Creek, Ten Mile Creek, Wildcat Branch, and Cabin Branch were included in the SPA (Figure 2) in order Ato assure that identified sensitive environmental resources were protected to the greatest extent possible from development activities@ (Approved and Adopted Clarksburg Master Plan, June 1994, page 206). AAchieving this rather delicate and imprecise balance was recognized to be a difficult goal but one which must be achieved if Clarksburg=s outstanding environmental setting is to be preserved@ (Approved and Adopted Clarksburg Master Plan, June 1994, page 18).

The Clarksburg Special Protection Area encompasses approximately 5228 acres of land. The Little Seneca Creek portion is designated by the state of Maryland as a Use IV-P stream (i.e. Recreational Trout Waters and Public Water Supply). Table 3 below lists the State standards for Use IV-P streams.

The Ten Mile Creek portion of the SPA includes all land east of the Ten Mile Creek mainstem and north of West Old Baltimore Road. Ten Mile Creek is designated by the state of Maryland as a Use I-P stream (Water Contact Recreation, Aquatic Life and Drinking Water Supply). Table 3 below lists the State standards for Use I-P streams. Historically, Ten Mile Creek was one of the last streams in Montgomery County to support Brook Trout.

Only two small portions of the Cabin Branch subwatershed are included in the SPA. These areas are identified as being outside projected 100' wide stream buffers and having a higher potential for groundwater contamination than the surrounding areas.

The inclusion of a small portion of the Wildcat Branch subwatershed is due to the potential for adverse impacts to the stream from anticipated development along Brink Road and the construction of Mid-County Highway. The Wildcat Branch portion of the SPA consists of any tributaries in the Clarksburg planning area that receive stormwater runoff from the Brink Road area and the future Mid-County Highway extension. The Wildcat Branch is designated by the state of Maryland as a Use Class III stream (protection of naturally reproducing trout populations). Table 3 below lists the State standards for Use III streams.

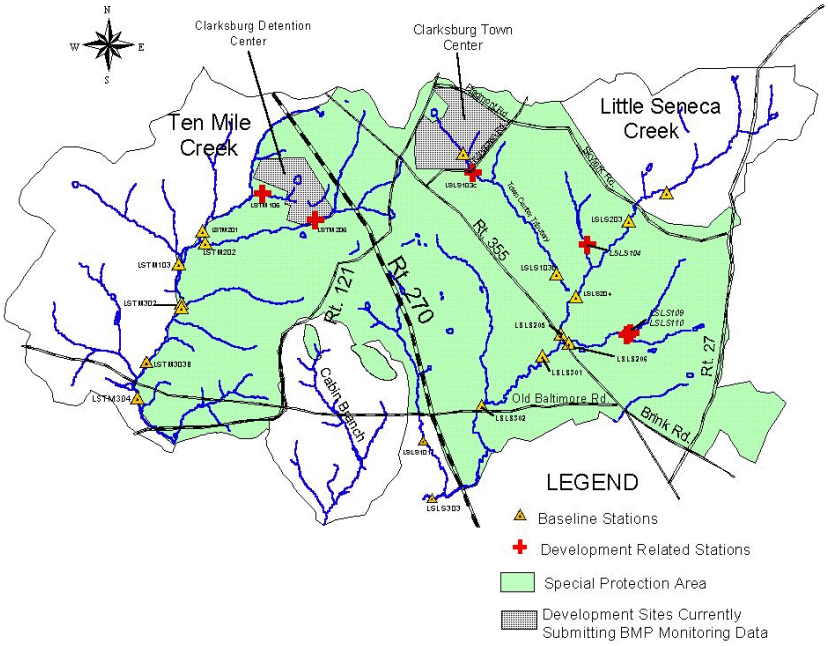


Figure 2. Clarksburg Special Protection Area

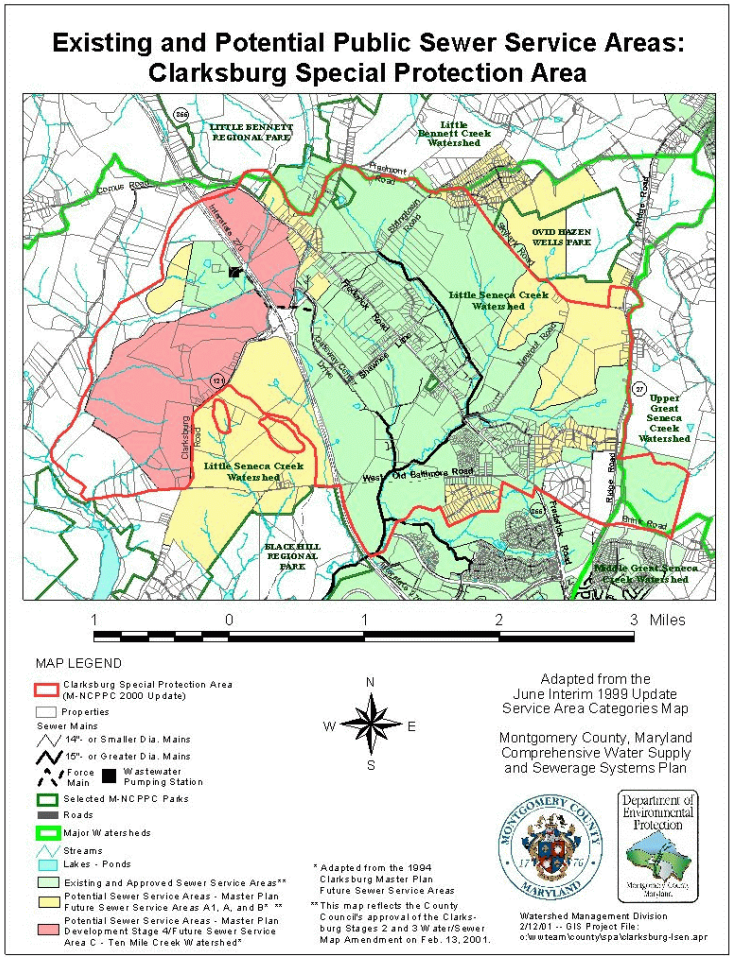
Table 3. Water Quality Standards for Maryland Streams

Parameter	Class I-P	Class III	Class IV-P
Maximum Total Fecal Coliforms (log mean per 100 mL)	200	200	200
Minimum Dissolved Oxygen (mg/L)	5	5	5
Minimum Daily Average Dissolved Oxygen (mg/L)	N/A	6	N/A
Maximum Temperature (Degrees Fahrenheit)	90^{o} or ambient (whichever is greater)	68^{o} or ambient (whichever is greater)	75^{o} or ambient (whichever is greater)
pH	6.5 to 8.5	6.5 to 8.5	6.5 to 8.5
Maximum Turbidity (NTU)	150	150	150
Maxumum Monthly Average Turbidity (NTU)	50	50	50
Total Residual Chlorine	N/A	No Chlorine Permissible	N/A

4.1.1 Extension of Water and Sewer Service and Increased Density of Development

In Montgomery County, Comprehensive Water Supply and Sewerage System Plan policies generally call for the provision of public sewer service on development zoned for densities of one unit per half-acre or greater. Moderate to high-density development requiring the provision of public water and sewer service typically results in higher levels of impervious surfaces. In some cases, such as Piney Branch and Upper Paint Branch, master plan recommendations allow for the limited provision of public sewer service to areas zoned for lower-densities. Public sewer service can allow for development density at or near the zoned maximum, leading to a potential for higher levels of impervious surfaces than would be expected for the same site using on-site septic systems. Public sewer service can help in some cases to preserve additional forested areas by eliminating the need clear septic trench areas.

Public water service generally serves the same areas as those served by public sewer, although County policies also allow for the provision of public water service alone in lower-density zoned areas, such as those zoned RE-1, RE-2 and Rural Cluster. The provision of public water service


Existing and Potential Public Sewer Service Areas:
Clarksburg Special Protection Area
LITTLE BENNETT REGIONAL PARK
Little Bennett Creek Watershed
Ridge Road
OVID HAZEN WELLS PARK
Little Seneca Creek Watershed
Upper Great Seneca Creek Watershed
Clarksburg Road
West Old Baltimore Road
Frederick Road
BLACKHILL REGIONAL PARK
Middle Great Seneca Creek Watershed
1 0 1 2 3 Miles
MAP LEGEND
Clarksburg Special Protection Area (M-NCPPC 2000 Update)
Properties
Sewer Mains
14"- or Smaller Dia. Mains
15"- or Greater Dia. Mains
Force Main
Wastewater Pumping Station
Selected M-NCPPC Parks
Roads
Major Watersheds
Streams
Lakes - Ponds
Existing and Approved Sewer Service Areas**
Potential Sewer Service Areas - Master Plan Future Sewer Service Areas A1, A, and B* **
Potential Sewer Service Areas - Master Plan Development Stage 4/Future Sewer Service Area C - Ten Mile Creek Watershed*
N
W
E
S
* Adapted from the 1994 Clarksburg Master Plan Future Sewer Service Areas
** This map reflects the County Council's approval of the Clarksburg Stages 2 and 3 Water/Sewer Map Amendment on Feb. 13, 2001.
Adapted from the June Interim 1999 Update Service Area Categories Map
Montgomery County, Maryland Comprehensive Water Supply and Sewerage Systems Plan
Department of Environmental Protection
Watershed Management Division
2/12/01 -- GIS Project File:
o:\wrteam\county\spa\clarksburg-isen.apr

without public sewer has not been nor is expected to be a significant driver of development density within these lower-density zoned areas.

The 1994 Clarksburg Master Plan recommends the majority of the Clarksburg SPA for public water and sewer service. The Clarksburg area is starting the initial expansion of public water and sewer service recommended in the master plan, primarily in the Town Center District located between Clarksburg and Stringtown Roads northeast of Route 355. The County Council recently approved an amendment to the Water and Sewer Plan which grants approval for public water and sewer service throughout much of the Development Stages 2 and 3 areas (Future Sewer Service Areas A1 and A) east of I-270; the accompanying map (Figure 3) reflects these approvals.

Two major Development Stage 3 areas remain as potential sewer service areas: the entire area west of I-270, primarily in the Cabin Branch subwatershed (Future Sewer Service Area B), and the northeastern part of the area east of I-270 (as shown on the accompanying map). Public sewer approval of these areas will require the inclusion in the WSSC capital improvements program (CIP) budget of the capital sewerage system projects (trunk mains, pumping stations, and force mains) needed to provide sewer service.

Another potential sewer service area within the SPA is Development Stage 4 (Future Sewer Service Area C) in the Ten Mile Creek subwatershed (shown in red on the map). Master plan staging triggers link development needing pubic water and sewer service in Stage 4 in part to the results of water quality monitoring for the earlier development stages. The requirements included in these staging triggers are more stringent than those for the preceding development stages in Clarksburg. These requirements reflect the concern in the Clarksburg Master Plan for, A... the environmentally fragile nature of the streams in this area ...@ The master plan requires DEP to conduct baseline biological assessment monitoring in the Little Seneca Creek and Ten Mile Creek watersheds for at least three years. Baseline biological assessment in these watersheds began in 1994. In 1996 the third year of baseline monitoring data was accumulated. DEP has continued to accumulate monitoring data in succeeding years.

The master plan also requires ongoing monitoring by DEP as development proceeds in the Newcut Road and Town Center (Stage 3) neighborhoods with the purpose of evaluating the water quality best management practices (BMPs) for that development. Clarksburg SPA stream monitoring (see Section 4.1.4) is providing information on stream conditions in these neighborhoods. DEP also requires BMP monitoring by developers in these areas (see Section 4.1.3). DEP is to provide its evaluation of these BMPs in the Annual Report on the Water Quality Review Process which follows immediately after the release of 2,000 building permits in the Newcut Road and Town Center neighborhoods. This is estimated to occur within the next 10 years. The County Council will then assess the results of DEP=s evaluation, along with considering capital infrastructure needs for the Stage 4 area and voluntary water quality protection measures taken by local property owners. Following the assessment, the approved and adopted Clarksburg Master Plan (June 1994), stipulates that the County Council can choose from among the following actions:

- Proceed with Stage 4 development by granting Water and Sewer Plan amendments allowing public water and sewer service.

- Proceed with Stage 4 development, as above, but with additional measures, such as more stringent water quality requirements and further development staging, to protect the watershed.

- Defer action on development in Stage 4, pending further study or consideration, by deferring the Water and Sewer Plan amendments needed for public water and sewer service

- Consider other land use options for the watershed, which may or may not require public water and sewer service.

4.1.2 Status of Development in the Clarksburg Master Plan SPA as of February, 2001

Approval of the Clarksburg Town Center project will lead to enormous changes in the landscape over the next few years. Phase I of the Clarksburg Town Center development is currently under construction with Phase II pursuing a Final Water Quality Plan approval. Two other notable proposed mixed-use subdivisions that are progressing through the development process are the DiMaio Property (approximately 400 acres) and Clarksburg Village (approximately 700 acres). These three subdivisions alone will account for about 1400 acres of new development which will be a significant increase in density and impervious area which will challenge the ability to sustain existing stream conditions in this watershed. Adding to this challenge are decisions which increased densities to absorb Transferred Development Rights (TDRs) on the Clarksburg Village site. Master planned medium to high density development in Clarksburg to address County goals to increase available housing and protect the agricultural resource have added impervious area and reduced available area for buffers and redundant stormwater management facilities.

Table 3 lists development projects which are active in the Clarksburg SPA. The table covers the time period from 1995 to February 2001. Table 4 is intended to provide the reader with a general idea of the locations, types, intensity, and stage of review or development of land development projects. As shown in the table, construction is currently underway on several projects in the watershed including the Montgomery County Detention Center (Seneca Correctional Facility), Nanna Property (Phase I), and Gateway 270 Corporate Park (Phase I and II). BMP baseline monitoring is currently being performed for the Town Center development and for the Detention Center.

Table 4. Clarksburg SPA Development Projects (1995 to February 2001)

PROJECT NAME	SPA LOCATION	DEVELOPMENT SIZE, TYPE	STATUS
Catawba Manor	Clarksburg, Little Seneca Subwatershed	10.9 acres (4.5 in SPA) RMX-2,R-200	Final water quality plan approved.
Catholic Cemetery B Germantown	Wildcat Branch	166 acres - approved for cemetery, church and school	Preliminary water quality plan approved.
Cellular Phone Antenna Site Ferguson Farm	Clarksburg, Little Seneca Creek Subwatershed	0.6 acres - RDT Communication tower and access drive in RDT zone	Exempt from water quality plan requirements. Sediment control permit issued. Stormwater management provided. As-built approved 2/23/98.
Clark Meadow, Phase I	Clarksburg, Little Seneca Subwatershed	37 acres, R-200	Subdivision plan approved before SPA designation. Construction nearly complete.
Clarksburg Detention Facility	Clarksburg, Ten Mile Creek Subwatershed	34 acres	Preliminary/Final water quality plan approved. Under final stage of construction.
Clarksburg Bus and Maintenance Depot	Clarksburg, Little Seneca Creek	9.28 acres	Water quality inventory approved.
Clarksburg Gateway (includes Highlands of Clarksburg)	Clarksburg, Little Seneca Creek	56.4 acres, RMX-2 and R-200	Preliminary water quality plan under review.
Clarksburg Heights	Clarksburg, Little Seneca Subwatershed	54 acres, R-200	Subdivision plan approved prior to SPA designation. Under construction.
Clarksburg Town Center -	Clarksburg, Little Seneca Subwatershed	269 acres, RMX-2, RDT	Preliminary water quality plan for entire site approved. Final water quality plan for 120 acres (Phase I) approved. Phase I is under construction.
Clarksburg Village (Newcut Village)	Clarksburg, Little Seneca Creek	700 acres, mixed use	Revised preliminary water quality plan submitted and under review. Added approximately 40 acres and revised the site layout.
DiMaio Property	Clarksburg, Little Seneca Creek	400+ acres, PD (Planned Development)	Preliminary water quality plan approved.
Egan Property (C.N. Sherwood Property)	Clarksburg, Ten Mile Creek Subwatershed	101.6 acres, R-200, Commercial Picnic / Catering Facility	Water quality inventory submitted. On hold for additional information (9/8/00).

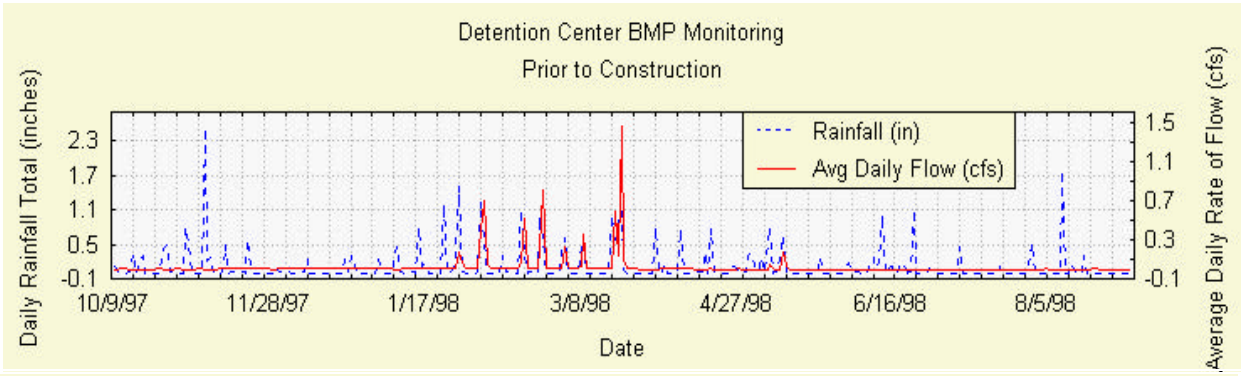
Table 4 Continued. Clarksburg SPA Development Projects (1995 to February 2001)

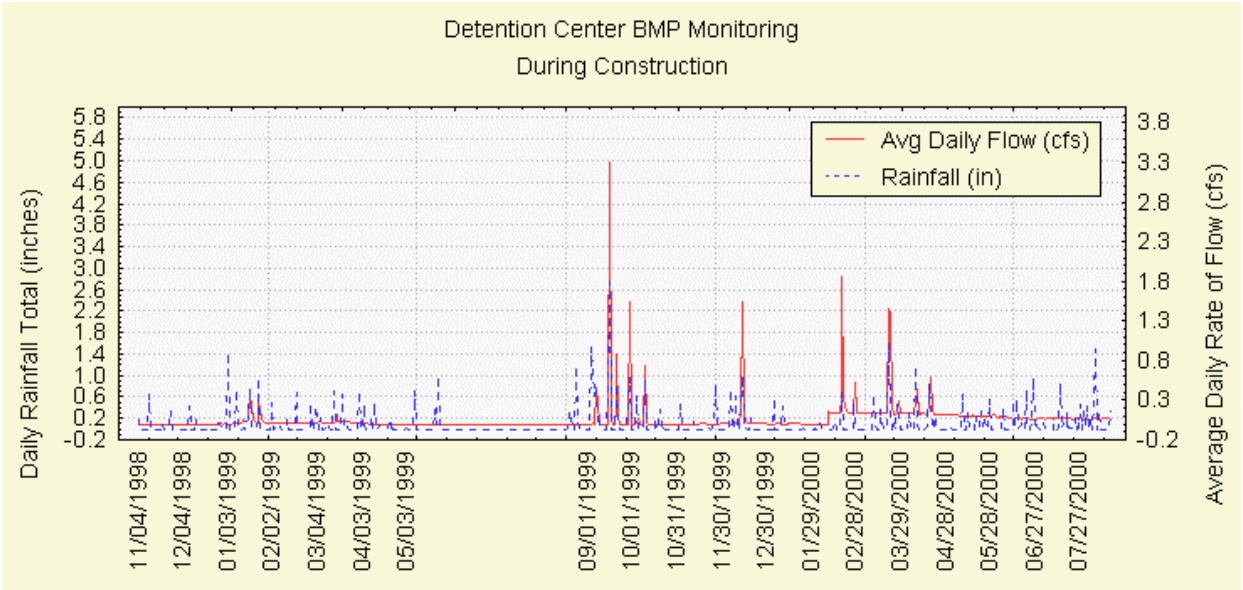
Funt Property	Town Center Subwatershed	27 acres, Residential	Preliminary environmental information provided to applicant.
Gateway 270 (Phase I)	Clarksburg, Little Seneca Creek	24.5 acres, I-3, 3 lots	Final water quality plan approved. Under construction.
Gateway 270 (Lot 7)	Clarksburg, Little Seneca Creek	4.9 acres, I-3	Pre-application meeting completed.
Gateway 270 West (Phase II)	Clarksburg, Little Seneca Creek	35.5 acres, I-3, 6 lots	Final water quality plan approved. Under construction.
Greenridge Baptist Church	Clarksburg, Little Seneca Creek	8.2 acres	Pre-application meeting completed. Project on hold.
Highlands of Clarksburg	Clarksburg, Little Seneca Subwatershed	16 acres, RMX-2 (high density)	Preliminary/Final water quality plan approved. This plan is now part of Clarksburg Gateway
Kingsley Wilderness School	Clarksburg, Little Seneca Creek	5.5acres, Montgomery County Site 30	Pre-application meeting completed.
Nanna Property (Phase I)	Clarksburg, Little Seneca Creek Subwatershed	4 acres, R-200	Subdivision plan predated SPA designation. Sediment control permit issued. Under construction.
Nanna Property (Phase II)	Clarksburg, Little Seneca Creek	12.1acres, R-200C, 24 lots proposed	Preliminary/Final water quality plan is under review.
Rocky Hill Middle School (New)	Clarksburg, Little Seneca Creek	23+ acres, School	Pre-application meeting completed.
Running Brook Acres	Clarksburg, Little Seneca Creek	11.7 acres, R-200, 21 lots approved (cluster)	Preliminary/Final water quality plan approved.

4.1.3 Summary of BMP Monitoring in the Clarksburg SPA

In this SPA there are four sites with approved BMP monitoring plans (Table 6). Two sites have provided data on baseline conditions and proceeded to the construction phase. Table 6 describes the monitoring plans of these two sites and identifies the data that has been received as of February 2001. The Clarksburg Town Center project completed one year of pre-development monitoring in 1998. The project began construction this past summer and construction monitoring is now under way. Construction data from this site should be available for the 2001 SPA Annual Report. The Clarksburg Detention Center is still under construction. Monitoring at the site during construction consists of monitoring the amount of flow from the sediment pond and the amount of rainfall on the site. Groundwater is being monitored for elevation and nutrient concentrations. Six samples of storm flows from the sediment pond have also been collected during construction. These samples have been analyzed for turbidity, suspended sediment and nutrients. Results of the storm samples are contained in the 1999 SPA Annual report. No additional storm sample analysis is planned during construction.

Figure 4 shows the rainfall and flow from the pond prior to and during construction. The plot of flow appears different from the plot included in last year's report. This is because we have determined that several data points on last year's graph resulted from false readings. This conclusion was reached following discussions with the consultant responsible for the BMP monitoring and close examination of the data and weather records. These readings were produced when the monitoring equipment froze during extremely cold weather. The erroneous data points have since been deleted. The data also indicates that there was an abrupt increase in baseflow in January of 2000 immediately after the equipment is suspected to have frozen. This apparent increase in baseflow is not considered to be an actual occurrence. The freezing of the equipment may have affected its calibration. Plotted storm data is only slightly affected by this situation. Additionally, the plot does not show rainfall or flow from May 26 1999 through August 17, 1999. This is not a problem as that was a drought period and there was little rainfall in the area during that time span.





The data shows that the sediment pond is performing as expected with respect to controlling peak runoff flows. In its construction phase, the site is not generating frequent large flows that would lead to drastic changes in the flow regime of the local streams. Increased storm flows can cause erosion and be very harmful to the biology of a stream. A storm that delivered 3.03 inches of rain in a 24 hour period produced an outfall flow rate from the pond of 15.79 cfs on 9/16/99. Observed storm runoff rates are not inconsistent with the final design parameters of the pond. When converted to its final configuration, the pond is designed to receive 28 cfs during a two year storm and release water at a rate of 9.9 cfs. A two year storm in Montgomery County is a rain event that brings 3.2 inches of rain within a 24 hour period. Peak flow rates for several storms prior to and during construction are given in Table 5.

Table 5. Detention Center Storm Flows

Pre-Construction

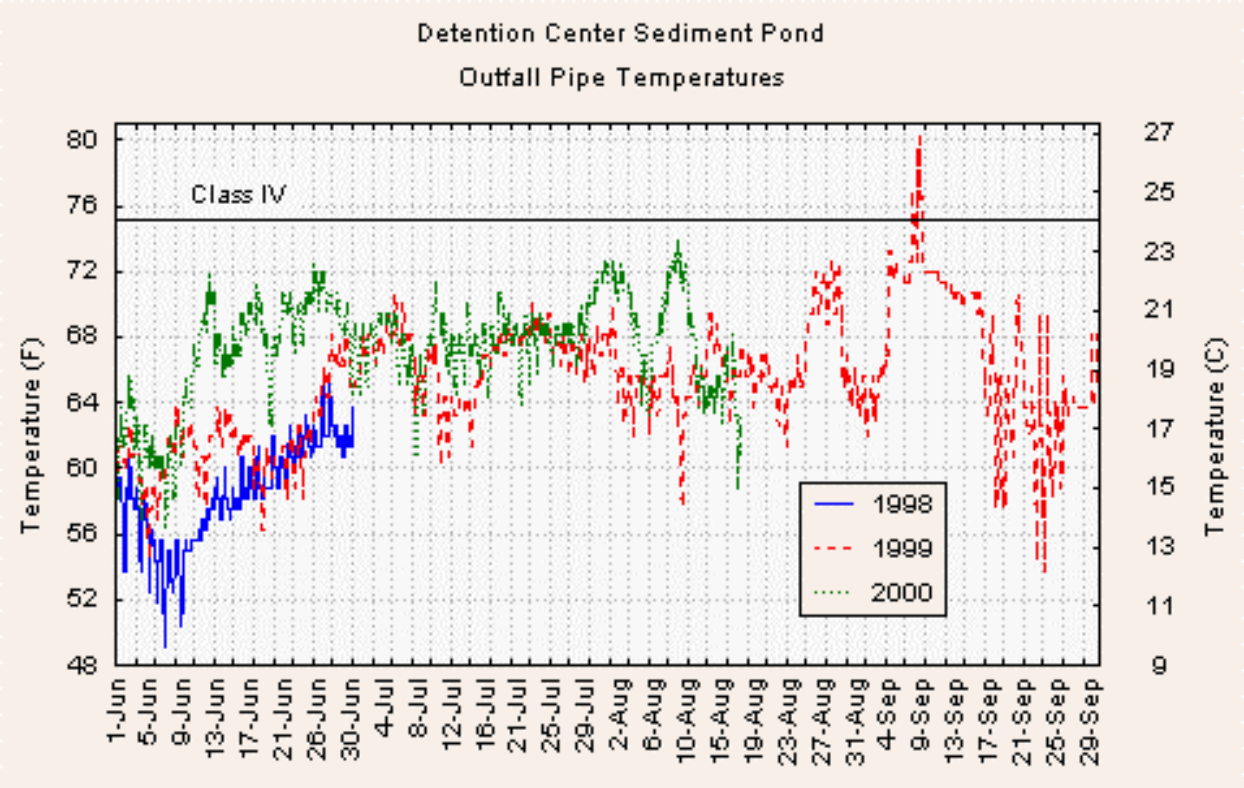
Date	Peak Flow (cfs)	24 Hour Rain Total (in)
3/21/98	6.66	1.92

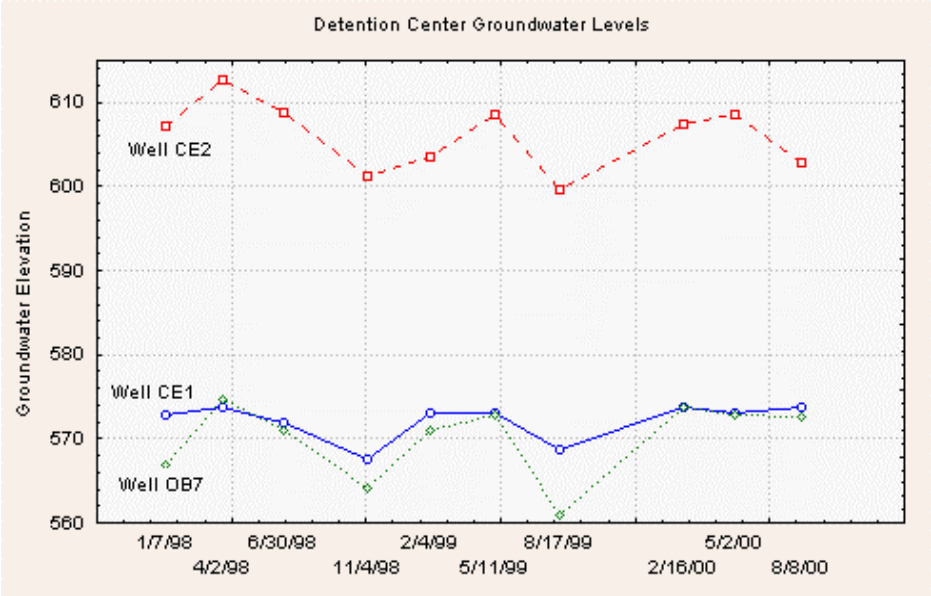
During Construction

Date	Peak Flow (cfs)	24 Hour Rain Total (in)
9/16/99	15.79	3.03
9/30/99	8.79	1.48
12/14/99	5.80	1.33
2/19/00	2.94	1.24
3/21/00	3.77	1.96

This pond is configured to keep sediment from leaving the site during construction. After construction of the Detention Center the pond will be reconfigured to provide quantity control of the two year storm. Until the pond is converted from a sediment pond to a water quality pond, evaluations of its effectiveness in controlling storm flows and maintaining water quality cannot properly be made. Following construction the pond will be much smaller. The pond was constructed when the site was being used for sludge entrenchment, and was designed to hold 100 year storms. It was meant to keep almost all storm flows on the site. It is greatly oversized as a sediment pond. In its completed form, after construction of the jail, it will be much smaller and configured to hold a two year storm. In this post-construction configuration it may release higher peak flows from large storms than prior to or during construction of the jail. It should still be able to control two year storms and smaller.

The temperature of the water leaving the pond continues to be well moderated. Temperatures in the outfall pipe are graphed in Figure 5. The graph indicates that the pond released water warm enough to stress stream organisms on only two occasions. On September 7 and September 8, 1999 temperatures exceeded 75 degrees for a total of 15 hours and 15 minutes. The maximum recorded temperature was 80.3 degrees. Examination of the graph of flow from the pond (Figure 4) indicates a rainfall and flow event on that date following a prolonged dry period.





Groundwater levels at the jail site seem to maintaining consistent levels. Figure 6 shows groundwater levels in three observation wells on the site. All three wells show a slight lowering of the water table during a drought period in late summer 1999. The groundwater readings returned to normal levels in winter 2000. Future monitoring will indicate whether development of the site results in a lowering of the water table. Increased imperviousness associated with development can cause rainwater to runoff that otherwise would infiltrate into the soils and maintain groundwater levels.

Nutrient monitoring of the groundwater at the site indicates elevated levels of nitrogen in well OB7 (Figure 7). The EPA drinking water standards for nitrate in well water call for a maximum concentration of 10 mg/L. Water in well OB7 has been as much as three times that standard. While this well is not being used for drinking water, these nitrogen levels indicate that local streams could potentially be receiving groundwater inputs with comparable levels of nitrogen. If levels of nitrogen in the streams reached these levels it could disrupt the ecology of the streams. Monitoring of the streams draining the site has not identified problems with biological communities. These elevated nitrogen readings are probably related to the former use of the site as a WSSC sludge entrenchment facility. Sludge contains high concentrations of nutrients.

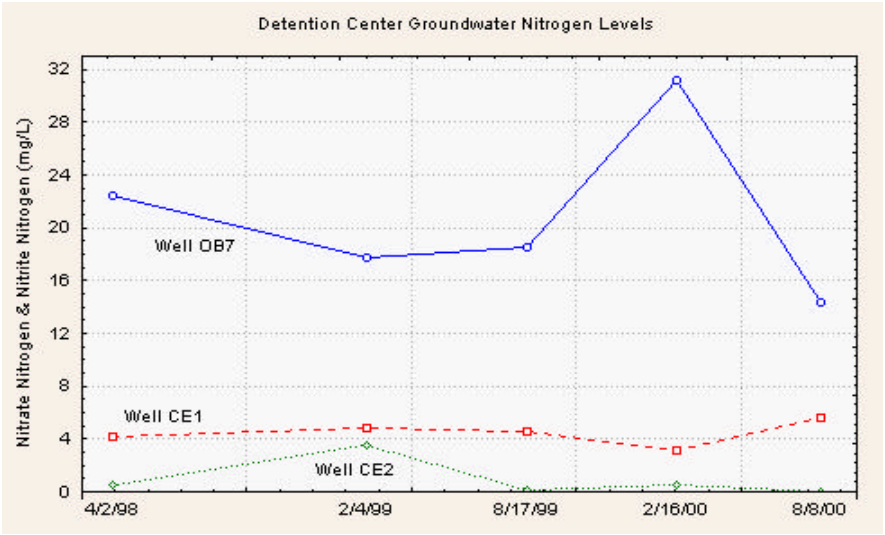


Table 6. Clarksburg SPA BMP Monitoring

PROJECT NAME & CONSULTANT CONDUCTING THE MONITORING	REQUIRED BMP MONITORING	REQUIRED TIME FRAME FOR BMP MONITORING	DATA SUBMITTED THUS FAR
Clarksburg Detention Center / Chester Engineers ***(construction phase began 9/98)***	**3 groundwater wells** *Ammonia, Total Phosphorus, Total Nitrogen, Specific Conductance, Nitrate, pH, Ortho-Phosphorus* **1 rainfall logger** - *along with the flow logger* **1 flow logger (SWM pond discharge rate***)* **1 continuous temperature logger**	**pre-development monitoring:** 6 months **during-construction monitoring:** until site is stabilized and sediment control ponds converted to stormwater management ponds **post-construction monitoring:** 3 years	**groundwater data:** 1/98 - 8/00 **rainfall data:** 1/98 - 8/00 **flow data:** 1/98 - 8/00 **temperature data:** 1/98 - 8/00
	stormwater monitoring **2 water quality stations to monitor sediment traps (inflow and outflow)**	during construction monitoring is to include 6 storm events	6 storm events received
Clarksburg Town Center / Biohabitats ***(Pre-construction monitoring complete. Construction has not started as of 2/00)***	**1 continuous flow logger** **1 rainfall logger -** along with flow logger **3 continuous temperature logging stations** **4 surface water quality stations:** *VOC, Oil and Grease, Herbicides & Pesticides, NO2, NO3, TN, TP, TSS, Metals, pH, DO, Conductivity*	**pre-development monitoring:** 1 year **during-construction monitoring**: until all infrastructure is installed, site stabilized and 50% of lots developed **post-construction monitoring**: 5 years	**flow and rainfall data:** 4/97 - 3/98 **temperature data:** June - September 1997 **surface water quality:** 5/97 & 6/97
Gateway 270 ***(Construction underway.)***	**2 continuous temperature loggers**	3 summers following permit approval	**temperature data:** 6/00-9/00
Gateway 270 West ***(Pre-construction monitoring complete. Construction underway.)***	**water quality monitoring at stormwater pond:** Cadmium, Copper, Lead, Zinc, Kjeldahl Nitrogen, Nitrate Nitrogen, Ammonia Nitrogen, and Ortho-Phosphate	**pre-development monitoring:** 3 storm samples **during-construction monitoring**: none **post-construction monitoring**: 3 storms per year for 3 years	**water quality data:** 3 storms 7/00

4.1.4 Summary of Stream Monitoring in the Clarksburg SPA

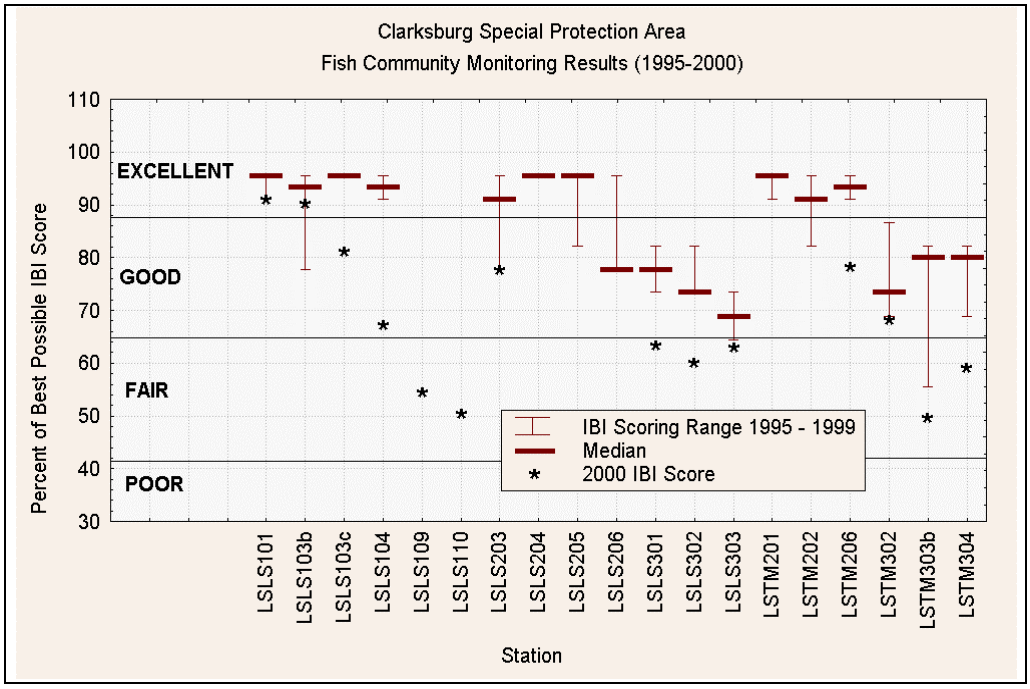
Baseline stream monitoring began in 1994 and is done on an annual basis at most stations throughout the SPA. Monitoring in 2000 was completed at 18 stations. Result from biological monitoring allow us to look at the extent of impact that the drought of 1999 had on the stream ecology. Also, the range of natural variability in the biological community and in stream habitat is better understood as the last six years of monitoring included wet and drought conditions.

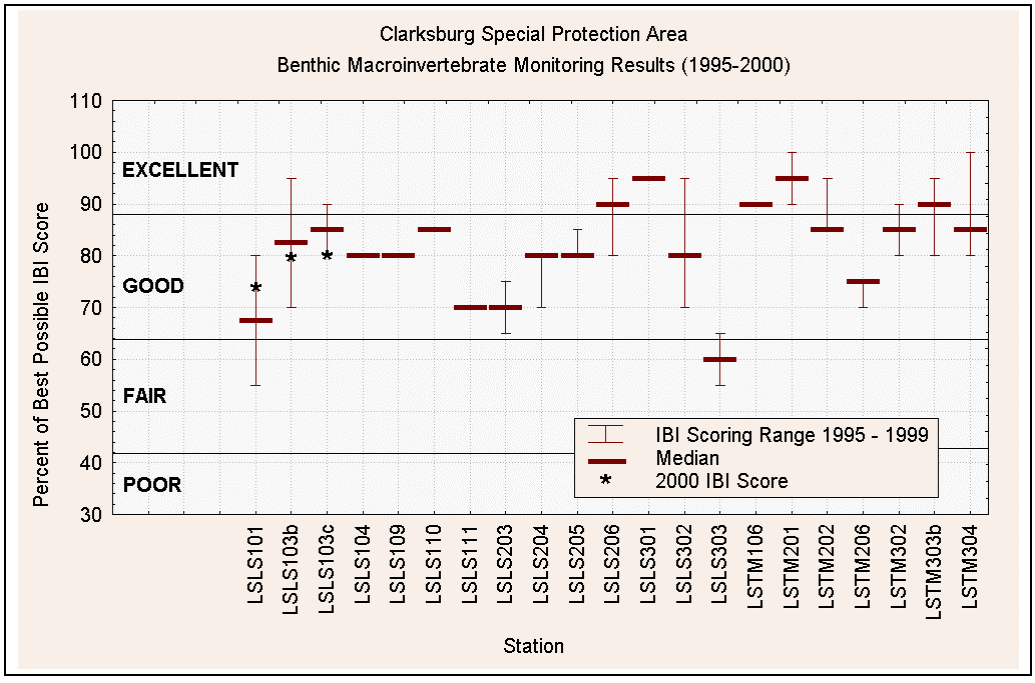
4.1.4.a Biological Monitoring Results

Results of all biological monitoring completed thus far in the Clarksburg SPA are presented in Figures 8 and 9. Fish monitoring in 2000 was completed at ten stations along Little Seneca Creek and four stations along Ten Mile Creek. Results of the fish monitoring are presented in Figure 8. As can be seen in the figure the fish community experienced some decline in quality at nearly all stations sampled in 2000. The change in the fish community that accounts for this decline was a reduction in the overall numbers of fish and in some cases, particularly in the smaller headwater stations, a reduction in those species that occupy the riffle habitat (that portion of the stream that flows fast and shallow over rocky substrate). This is likely lingering effects of extremely low stream flow conditions that persisted through much of the summer of 1999, particularly in the tributaries. During periods of drought the riffle habitat is greatly reduced, sometimes to a single narrow trickle of water through the rocky substrate. As a result, fish that had occupied the riffle habitat during previous years either find refuge downstream or they die. Drought impacts are a part of natural variability experienced in all streams. We expect to see some improvement in terms of the numbers of fish overall and in those fish that occupy riffle habitat over the next several years.

Four stations sampled in Little Seneca Creek (LSLS103C, LSLS104, LSLS109, LSLS110) are located in small tributaries where the fish community is influenced more by stream size and habitat availability then water quality. Naturally, these stations experienced a greater decline of the fish community in response to the 1999 drought. However, station LSLS103C, located in the upper Town Center Tributary, experienced only a slight drop in the fish community and no decline in the benthic macroinvertebrate community. This is very telling, and demonstrates the ability of this tributary to support a diverse biological community during stressful drought conditions. This is likely tied to dependable stream baseflow in the Town Center Tributary which is maintained during periods of drought.

Monitoring results from Ten Mile Creek show some decline in the fish community at all stations sampled during 2000. However, the decline was less then what might have been expected considering that much of Ten Mile Creek mainstem was dry during most of August 1999. Several of the small feeder tributaries did maintain some baseflow which allowed the fish to hold over until more favorable flow conditions returned. This prevented the extirpation of several fish species from the watershed.


Clarksburg Special Protection Area
Fish Community Monitoring Results (1995-2000)
Percent of Best Possible IBI Score
110
100
90
80
70
60
50
40
30
EXCELLENT
GOOD
FAIR
POOR
IBI Scoring Range 1995 - 1999
Median
2000 IBI Score
LSLS101
LSLS103b
LSLS103c
LSLS104
LSLS109
LSLS110
LSLS203
LSLS204
LSLS205
LSLS206
LSLS301
LSLS302
LSLS303
LSTM201
LSTM202
LSTM206
LSTM302
LSTM303b
LSTM304
Station


Clarksburg Special Protection Area
Benthic Macroinvertebrate Monitoring Results (1995-2000)
Percent of Best Possible IBI Score
110
100
90
80
70
60
50
40
30
EXCELLENT
GOOD
FAIR
POOR
IBI Scoring Range 1995 - 1999
Median
2000 IBI Score
LSLS101
LSLS103b
LSLS103c
LSLS104
LSLS109
LSLS110
LSLS111
LSLS203
LSLS204
LSLS205
LSLS206
LSLS301
LSLS302
LSLS303
LSTM106
LSTM201
LSTM202
LSTM206
LSTM302
LSTM303b
LSTM304
Station

4.1.4.b Habitat Monitoring

Rapid Habitat Assessment

A rapid habitat assessment is conducted in conjunction with biological monitoring. This is a visual based qualitative habitat assessment evaluating 10 habitat parameters. The scores for each parameter are summed and the score is used to assign a narrative habitat condition of either optimal, sub-optimal, marginal, or poor at each monitoring station. The rapid habitat assessment score is also used to help determine if stream habitat conditions are degraded enough to cause impairment to the biological community.

Results of rapid habitat assessments presented in last years SPA annual report revealed a problem with sediment deposition at station LSLS203. Monitoring results from 2000 indicate sediment deposition is no longer a problem at this station. It is possible that a pulse of sediment moved through the stream channel which was observed at this station during the spring of 1999. Pulses of sediment conveyed through a stream channel can come from a variety of sources such as: stored sediment behind a dam or road crossing suddenly released, bank failure, or land disturbance to name a few. The source of sediment observed at LSLS203 during 1999 was not determined and appears to have been a short term problem.

Other problems with habitat which were identified in last years annual report continue to exist. These include poor riparian buffer at stations LSLS203, LSLS205, LSLS302 (photos 1 - 4) and problems with bank stability at LSLS205, LSLS302. The lack of a forested riparian buffer at two stations (LSLS203 - photo 1 and LSLS205 - photo 2) will be addressed in water quality plans for adjacent development projects through reforestation requirements.

Photo 1. Lack of forested riparian buffer at LSLS203, LSLS205, upstream of Rt. 355

Photo 2. Sparse forest cover in riparian buffer at downstream of Skylark Rd.

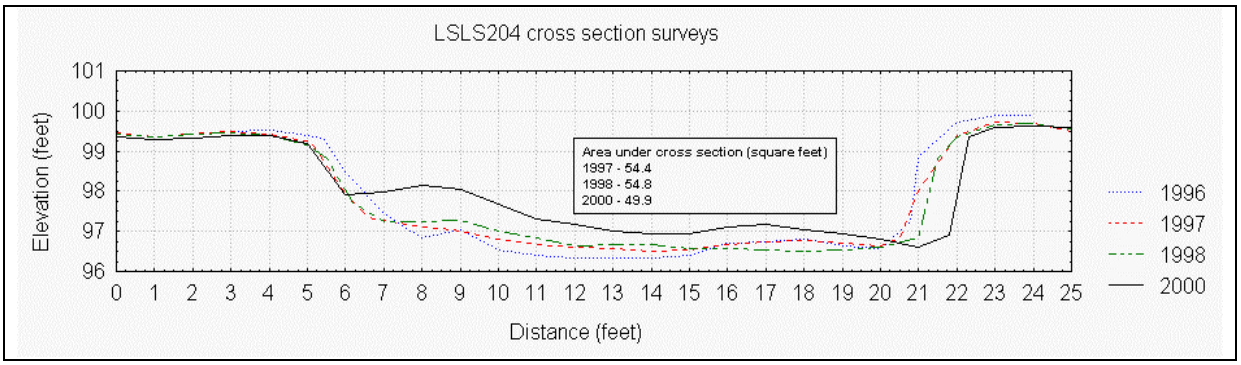
Photos 3 and 4 show the absence of any forested buffer along Little Seneca Creek in the vicinity

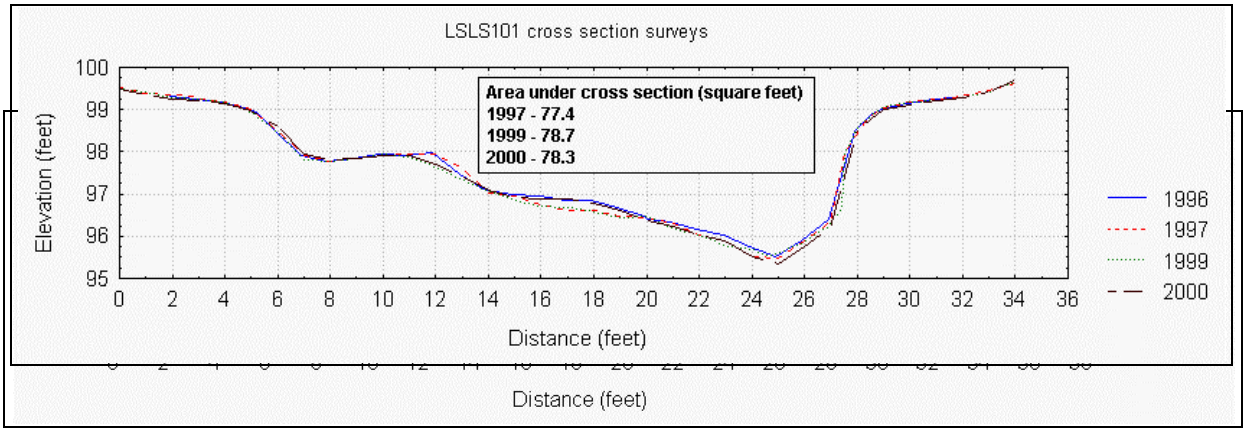
of West Old Baltimore Rd (LSLS302). Presently, there are no plans for development which would result in reforestation of the buffer. DEP will work with Montgomery Soil Conservation District and land owners to explore the possibility of reforestation along the stream buffer.

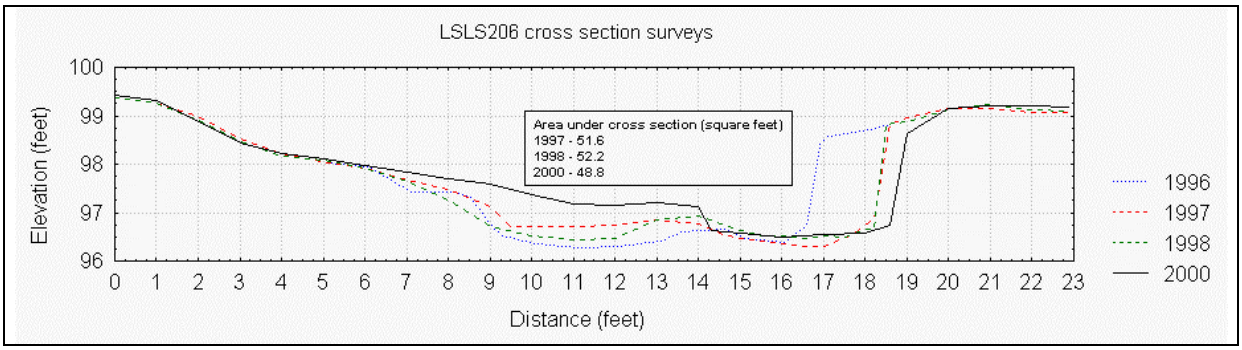
Rapid habitat assessments conducted along Ten Mile Creek did not reveal any new problems in 2000. The stream remains in the good range for habitat throughout the watershed.

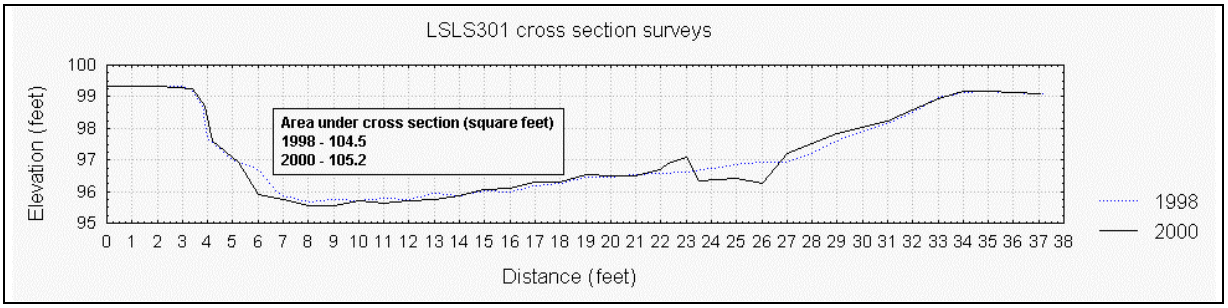
Stream Channel Morphology Monitoring

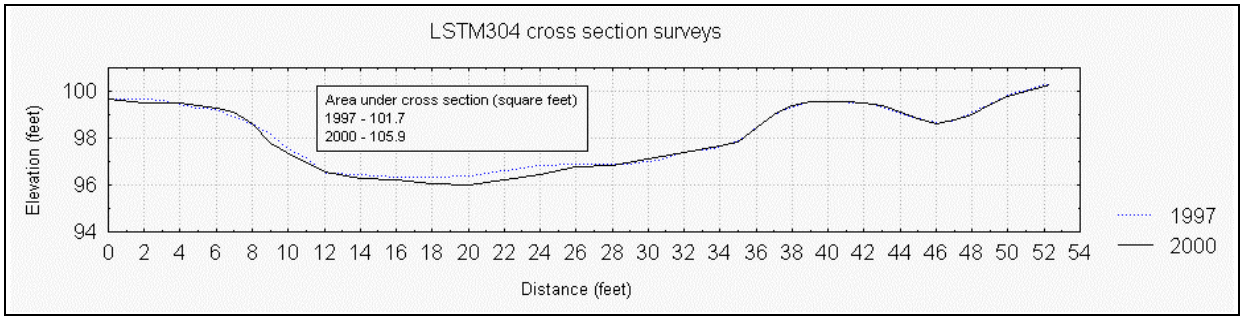
Quantitative habitat assessments were completed at 11 stations in the Clarksburg SPA during 2000. One component of this monitoring involves surveying the stream channel cross section over time to determine if channel enlargement is occurring in response to new development in the watershed. Results from four years of channel surveys, with little new development in the watershed, indicate that stream channels in some areas of the watershed are experiencing a higher rate of change, in terms of stream channel dimensions, than others. This is probably due to such factors as valley slope, flood plain width, stream bank soil composition, stream channel substrate and wide spread agriculture in the watershed. Stations in the Little Seneca Creek watershed where we are seeing higher rates of change include LSLS204, LSLS205 and LSLS206 (see Figures 10 - 12). At two of these stations (LSLS204 and LSLS206) the stream channel has decreased in cross sectional area. At station LSLS204 (located approx. 800 meters upstream of Rt. 355), for example, the cross sectional area of the stream channel decreased by 4.5 square feet as sediment deposits have built up on the left side of the stream channel (figure 10). At station LSLS205 (located approx. 200 meters upstream of Rt. 355) the stream channel has increased in cross sectional area by 10.1 square feet as both widening and deepening of the stream channel has occurred (figure 11). Stations in Little Seneca Creek where the stream channel has remained relatively stable over the past four years include LSLS301 and LSLS101 (Figures 13-14). Stream channel surveys in Ten Mile Creek over the past four years have shown little change in channel dimensions (Figure 15).


LSLS204 cross section surveys
Area under cross section (square feet)
1997 - 54.4
1998 - 54.8
2000 - 49.9
Elevation (feet)
Distance (feet)
1996
1997
1998
2000

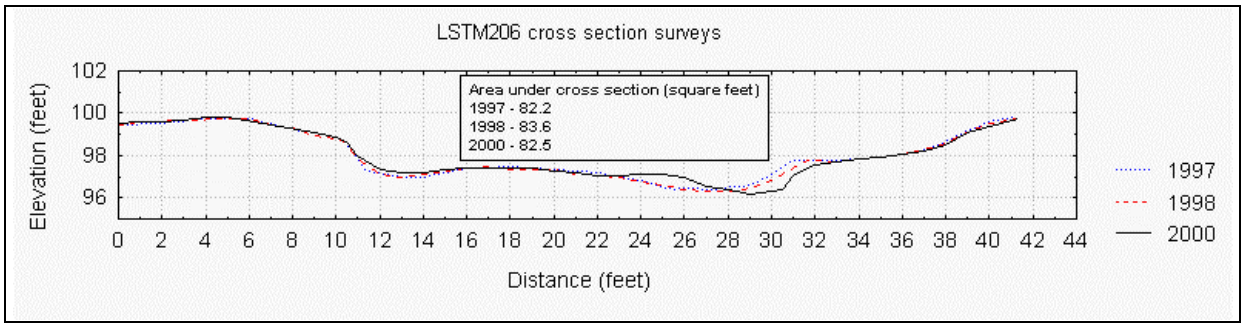

LSLS101 cross section surveys
Area under cross section (square feet)
1997 - 77.4
1999 - 78.7
2000 - 78.3
Elevation (feet)
Distance (feet)
1996
1997
1999
2000


LSLS206 cross section surveys
Area under cross section (square feet)
1997 - 51.6
1998 - 52.2
2000 - 48.8
Elevation (feet)
Distance (feet)
1996
1997
1998
2000


LSLS301 cross section surveys
Area under cross section (square feet)
1998 - 104.5
2000 - 105.2
Elevation (feet)
Distance (feet)
1998
2000


LSTM304 cross section surveys
Area under cross section (square feet)
1997 - 101.7
2000 - 105.9
Elevation (feet)
Distance (feet)
1997
2000

Two stations were set up along tributaries to Ten Mile Creek so we can evaluate conditions immediately down stream of the Clarksburg Detention Center (LSTM106 and LSTM206). Thus far, little change in stream channel dimension has been observed at these two stations (Figure 16).



In addition to stream channel surveying, semi-quantitative measurements of various habitat features within the stream channel are taken annually. These include: proportion of habitat types (riffle, pool, run) within a 75 meter stream segment, percent of stream banks covered with vegetation, pebble count, height of stream banks, entrenchment and width/depth ratio. Quantitative stream habitat measurements have been taken at each monitoring station in the watershed since 1996. These measurements will be used to form a baseline of habitat condition and to evaluate changes in stream habitat as development proceeds in the watershed.

4.1.4.c Stream Temperature Monitoring

Continuous temperature loggers were deployed in Little Seneca Creek at 5 stations during the summer of 2000 (Figure 17). The summer of 2000 (June 1 - Sept. 30) was generally cooler and wetter then previous summers resulting in lower water temperatures. At station LSLS301, for example, average summer water temperature was 64.0 ^{o}F in 2000 (wet year), 65.9 ^{o}F in 1995 (›normal year‹) and 67.5 ^{o}F in 1999 (drought year). This range in average water temperature from several years represents the natural variability for the stream at station LSLS301. Future temperature monitoring will determine if the stream remains within this range as new development occurs in the watershed.

All tributaries of Little Seneca Creek, upstream of Little Seneca Lake are designated as Use IV-P (Recreational Trout Waters and Public Water Supply) by the State of Maryland. All tributaries of Ten Mile Creek are designated as Use I-P (Water Contact Recreation & Protection of Aquatic Life). Water temperature criteria for Use IV-P and I-P is 75^{0} F and 90^{0} F., respectively, which means that discharges to the creek can not result in ambient water temperature that exceeds these criteria. At station LSLS301 the 75 degree criteria was exceeded on fifteen days during 1999 and 0 days during 2000. The 1999 condition seemed to primarily reflect the hot, extremely dry drought period which impacted all County streams.

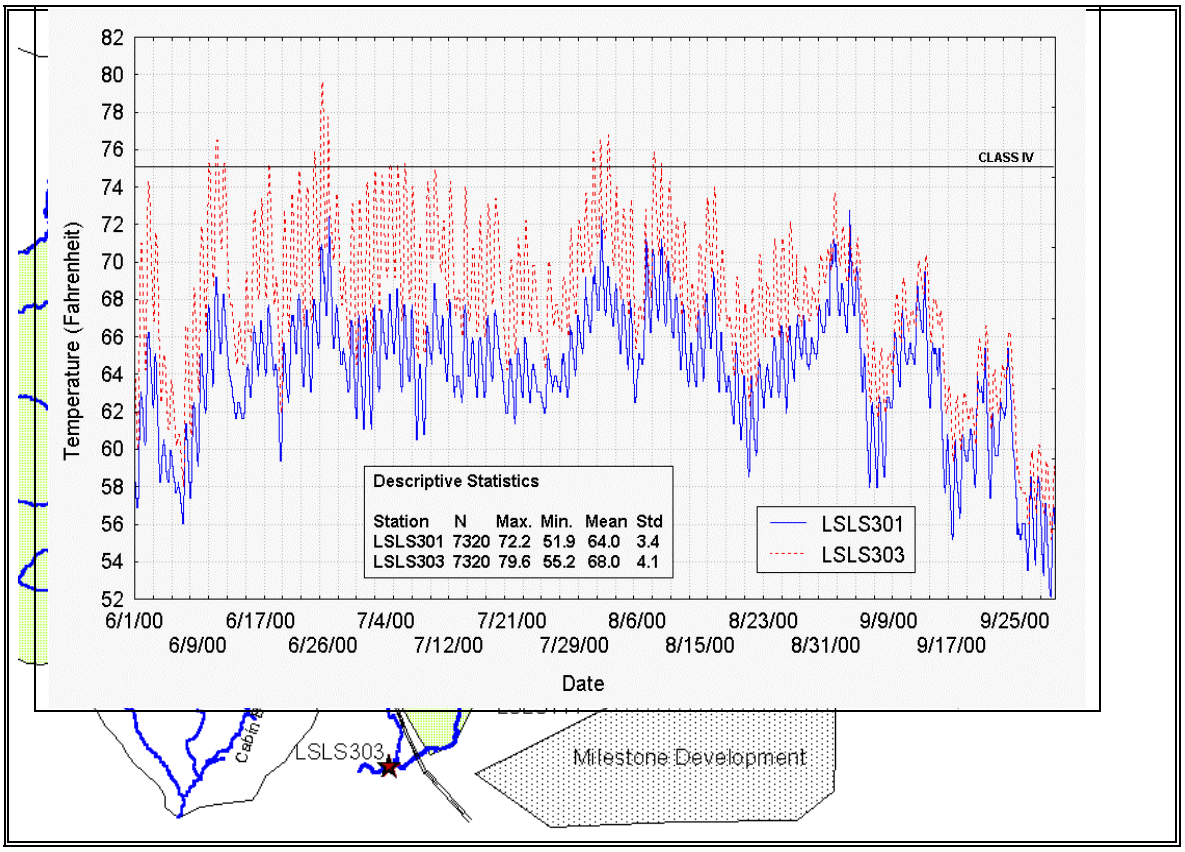


Figure 17. Locations of continuous water temperature loggers during the summer of 2000 are shown with red stars.

Much of the Little Seneca Creek mainstem, between stations LSLS301 and LSLS303 has little or no wooded riparian area and consequently no shading to keep water temperatures low during the summer months (see photos 3 and 4). We have documented a decline in biological condition (excellent to fair for benthic macroinvertebrates) between these stations and have theorized that one of the causes is increased water temperatures. Temperature monitoring during the summer of 2000 was set up to address the question.

Results are presented in Figure 18 and show that, on average, water temperatures increased by four degrees Fahrenheit between station LSLS301 and LSLS303.

Temperature loggers were also placed at stations LSLS302 and LSLS111 (Figures 19 and 20). The purpose of placing one at LSLS302 was to see if the large wetland above this station was causing increased water temperatures. Between stations LSLS301 and LSLS302 the stream passes through a braided network of shallow channels, aquatic vegetation and beaver ponds where the water is exposed to sunlight for extended periods of time. Results from LSLS302 are interesting in that average water temperatures are three degrees warmer then LSLS301 and large daily swings in temperature occur indicating that sunlight exposure is the cause.

Figure 18. Water Temperatures from Stations LSLS301 and LSLS303

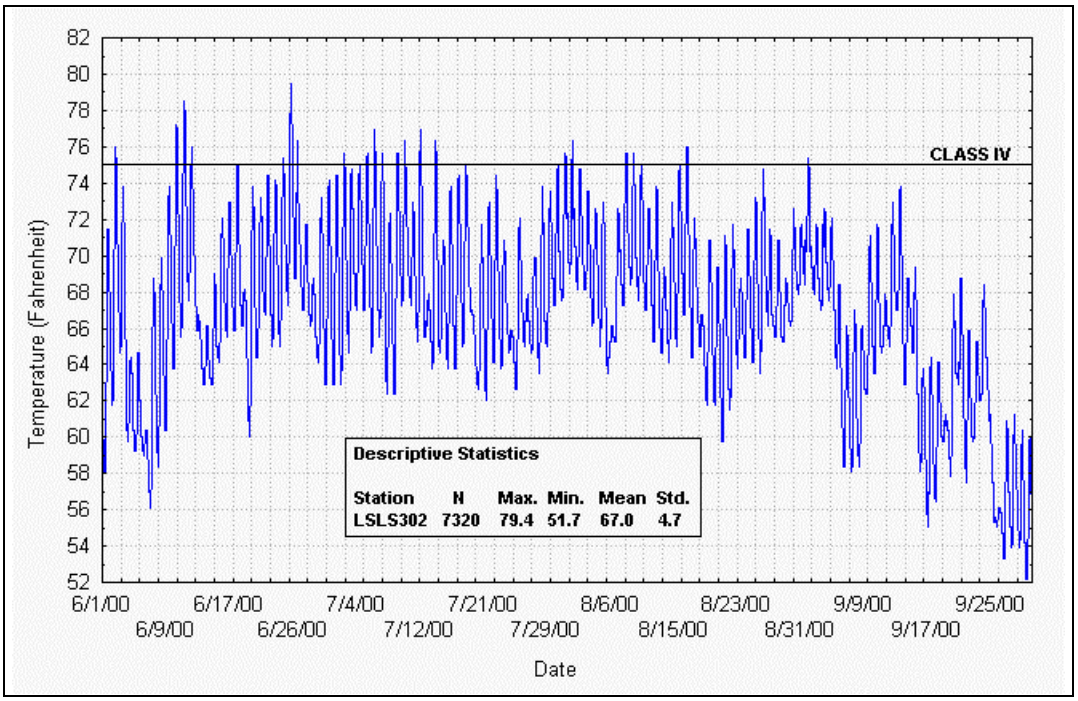
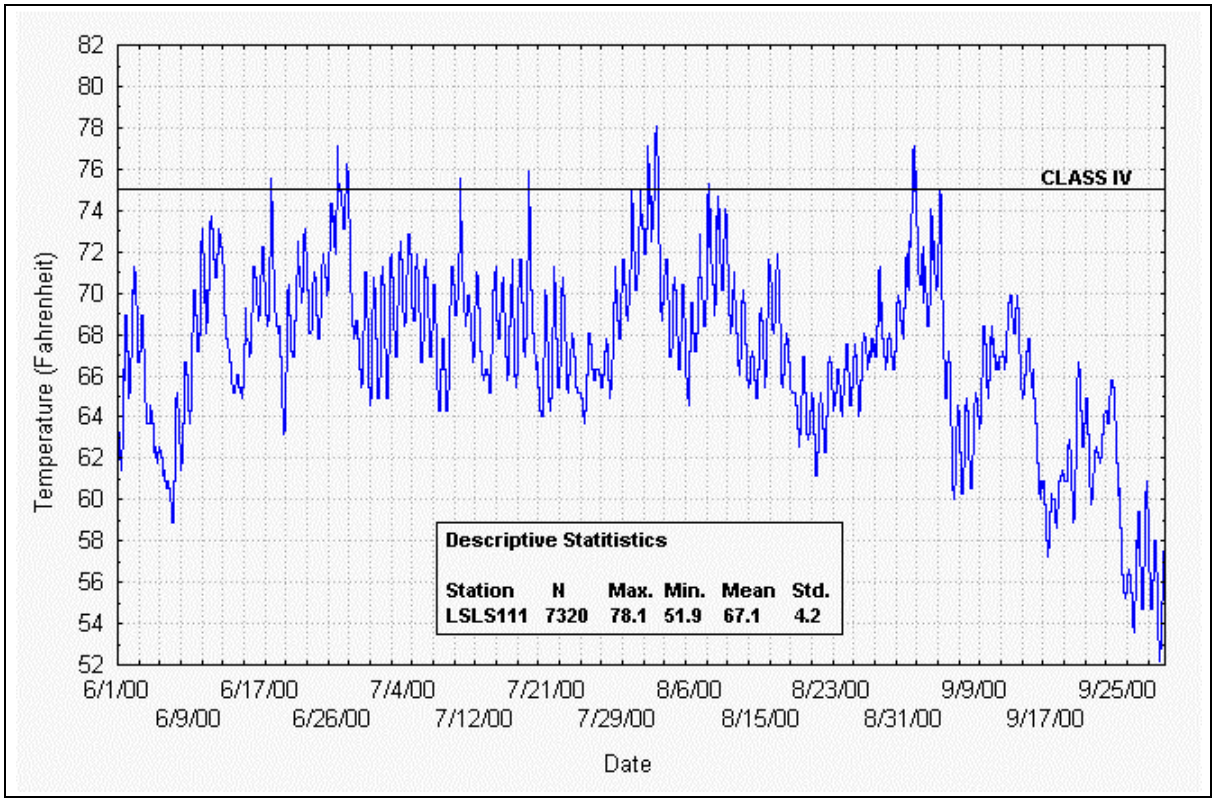


Figure 19. Continuous Water Temperatures From Station LSLS302

A temperature logger was placed at station LSLS111 (figure 17) to determine if any thermal impact was coming from the Milestone tributary. Results presented in Figure 20 indicate that average water temperature was three degrees (Fahrenheit) warmer than LSLS301 and therefore could be considered as a thermal impact. Typically, water temperatures are cooler in the small feeder tributaries and increase in a downstream fashion. However, in this case the small tributary (LSLS111) was three degrees warmer then the mainstem (LSLS301). Thermal impacts on this tributary are not understood but are likely coming from the Milestone development which lies outside the Clarksburg SPA.

Figure 20. Continuous Water Temperatures From Station LSLS111.

Summer of 2000 is the third year that water temperature loggers have been deployed at station LSLS103C along the Town Center Tributary (figure 17). The purpose of placing a logger here for a third summer was to provide additional data for the establishment of baseline water temperature conditions before construction of the new Clarksburg Town Center. During the three summers of monitoring, stream water temperature never rose above the 75 F. degree Use IV-P criteria. The fact that this small tributary maintains cool water flow during the stressful



summer months is the primary reason for a stable biological community which we have documented over the past five years. A summary of results from three years of continuous water temperature monitoring at station LSLS103C is presented in Table 7.

Table 7. Summary of Continuous Water Temperature Data From Station LSLS103C

Year	Number of observations	Maximum	Minimum	Mean	Standard Deviation
1997	7320	71.7	51.1	61.7	3.69
1998	3196	71.7	53.3	64.1	3.36

2000	7320	74.1	51.7	64.9	3.88

In summary, results from temperature monitoring during the summer of 2000 show that considerable warming occurs between station LSLS301 (Rt. 355) and LSLS303 (Rt. 270). Most of the warming occurs between stations LSLS301 and LSLS302 (West Old Baltimore Rd.) due to the water passing through shallow braided channels, beaver ponds and open buffer areas. Additional warming occurs downstream between stations LSLS302 and LSLS303 due to a long run (approximately 0.25 miles) through open pasture land (Photos 3 and 4). DEP will investigate the feasibility for reforestation of this area.

We have shown that stream water temperatures in the Town Center tributary remain cool during summer months which is the primary reason for a stable biological community in this tributary. It is hoped that this condition will remain after construction of the new Clarksburg Town Center. Stormwater management accompanying planned development have incorporated various methods (ie. infiltration, ›coolwater recharge:) into the site design to mitigate impacts of anticipated increased runoff temperatures.

4.2 Upper Paint Branch Special Protection Area

4.2.1 SPA Designation History for the Upper Paint Branch SPA

The Paint Branch watershed is designated as a Use III naturally reproducing trout stream north of I-495. Previous long term biological and habitat monitoring results had indicated that certain portions of the watershed experienced considerable stress from prior land development activities. In order to protect this watershed and its unique urban cold water natural resource, the County Council designated the Upper Paint Branch watershed above Fairland Road a Special Protection Area on July 11, 1995. In addition to this designation, an environmental overlay zone covers Upper Paint Branch. This overlay zone requires a ten percent impervious area cap on new development. This overlay zone was originally recommended by the 1981 Eastern Montgomery County Master Plan. Upper Paint Branch is currently the only SPA which has a specific limit on site imperviousness for new development throughout the SPA.

The SPA requirements, criteria, and guidelines are applied to all proposed land-disturbing activities. Unlike the other SPA=s, there are no exemptions from SPA provisions related to a proposed project=s size or land use. However, if a hardship condition is determined, the Planning Board or DPS, as applicable, may waive any or all of the SPA requirements, criteria, and guidelines for a project as a part of the water quality plan review and approval. Although not exempted from all SPA requirements, some projects are not required to conduct BMP monitoring if their small size or distance from a stream makes monitoring impractical. These specific requirements in the Upper Paint Branch SPA are strictly applied to new development and redevelopment within the SPA (Table 6).

To provide additional environmental protection, the County Council approved an environmental overlay zone for the Upper Paint Branch SPA in July, 1997. The overlay establishes the ten percent site imperviousness cap as a requirement, prohibits certain land uses, requires special land management practices for certain special exceptions, and establishes very limited provisions for grandfathering, exempting, and waiving specific, existing uses from the site imperviousness cap.

DEP is pursuing separate capital project initiatives in the Upper Paint Branch SPA to improve the management of runoff from previously developed areas and mitigate areas of habitat damage that had occurred before the SPA program was established. These projects are intended to supplement improvements in watershed management achieved through the SPA permit process. DEP has worked closely with the M-NCPPC and other agencies to inventory some 75 potential stream habitat restoration, wetlands creation, and stormwater retrofit project opportunities. Some of these are capital projects. Others involve small habitat restoration and wetlands and tree plantings that can be partially implemented by volunteers.

As of May 2001, five (5) projects have been completed in the Good Hope subwatershed and there is one (1) completed project in the Gum Springs subwatershed. A total of ten (10) projects are in the design phase. Three (3) of these projects are in the Gum Springs subwatershed. Two (2) projects are in the Right Fork subwatershed and one (1) is in the Left Fork subwatershed. Four

(4) projects under design in the Good Hope subwatershed are nearly ready for construction and should be completed this year.

4.2.2 Description of the Watershed Within the Upper Paint Branch SPA

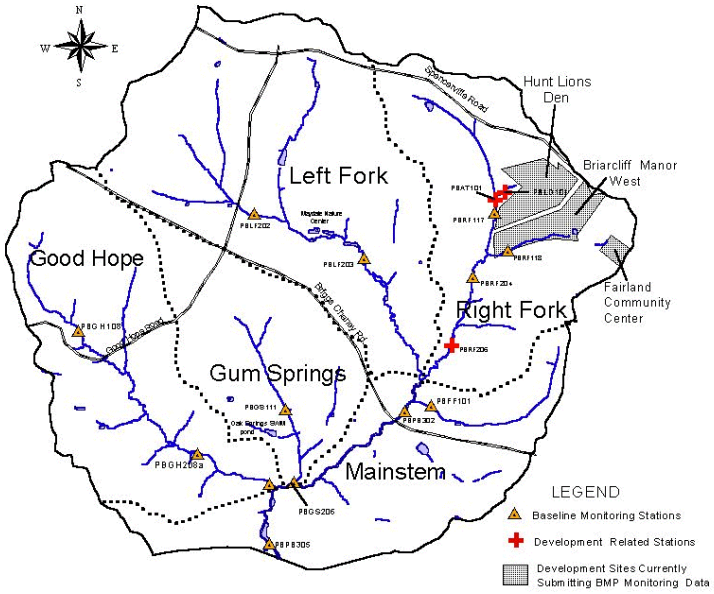
Paint Branch is recognized as a unique County resource due to its ability to support a naturally reproducing trout population in a suburban setting. The Upper Paint Branch SPA encompasses the entire watershed above Fairland Road (Figure 21). For management purposes the watershed is divided into five (5) subwatersheds; the Left Fork, the Right Fork, Gum Springs tributary, Good Hope tributary, and the Paint Branch mainstem.

Numerous studies have generally found that the Good Hope tributary is the primary trout spawning and nursery area for the Paint Branch system. This tributary consistently produces the highest percentage of young-of-year trout within the entire Paint Branch watershed. Gum Springs and the Right Fork subwatersheds supply water of excellent quality and also provide trout spawning habitat. Similarly, the Left Fork provides high water quality and acceptable habitat for trout, but is not consistently used as a spawning and nursery area. Each of these subwatersheds is important in maintaining the water quality, in-stream habitat and overall ecological health within the Paint Branch mainstem.

4.2.3 Status of Development in the Upper Paint Branch SPA as of February 2001

During the last year, the proposed development projects within the Upper Paint Branch SPA have been for small (1 to 8 acres) residential subdivisions. This trend has been generally consistent since the SPA was implemented. Since there are no exemptions for smaller subdivisions in this SPA, each development must comply with the SPA regulations. Some non-residential projects begun in the last few years in this SPA are the Safeway store in Cloverly (under construction), the Fairland Community Recreation Center (construction complete), the Good Hope Union United Methodist Church (construction complete), the Cedar Ridge Community Church (under construction), the Spencerville Post Office (construction complete) and the Old Columbia Pike Pedestrian Improvements (under construction).

The majority of the building permits that have been issued were for individual houses on existing recorded lots. Development of lots that were recorded before October 31, 1994 are not subject to the SPA regulations. These developments however, are reviewed for conformance to the ten percent imperviousness cap that is mandated by the environmental overlay zone and encompasses the entire SPA portion of the Paint Branch watershed. To comply with the overlay zone requirements, DPS requires proof that each application for a building permit that is not required to get Planning Board approval, will not exceed the ten percent impervious cap.


N
W
E
S
Hunt Lions Den
Briarcliff Manor West
Left Fork
Good Hope
Fairland Community Center
Right Fork
Gum Springs
Mainstem
LEGEND
Baseline Monitoring Stations
Development Related Stations
Development Sites Currently Submitting BMP Monitoring Data

The ten percent site imperviousness cap is also an important part of the development projects that require Planning Board approval. Imperviousness limits set as part of a Planning Board approval of a project are enforced through a written agreement between the Board and the applicant. Of the projects that have obtained Planning Board approval (and Planning Board and DPS approval of the water quality plans), three projects were granted waivers of the 10 percent impervious cap by the Planning Board. One project will acquire land (known as pervious area reserve land) outside the project=s original boundaries to maintain pervious and vegetative cover to achieve the specified site imperviousness limit.

The Fairland Community Recreation Center meets the ten percent cap requirement with additional land to be purchased off-site (but within the SPA) and placed in a conservation easement. The Good Hope Union United Methodist Church project reduced its imperviousness from 32.7 percent to 17.8 percent through the purchase of pervious area reserve land, and the Planning Board approved a waiver of the remaining impervious area over the ten percent cap. This was done in recognition of the church=s long-standing ties to the Good Hope community and the hardship involved. The Planning Board approved a waiver of the ten percent impervious cap for the Cloverly Safeway project based on the community benefits of this development (including the creation of a new store that is greatly desired by the community, and the creation of stormwater management facilities on a commercial site that currently has no stormwater controls). Additionally, the Planning Board determined that the impervious cover was reduced as much as possible (originally proposed 75% cover and ultimately reduced to 68% cover), while meeting all of the other development requirements. The plan for pedestrian improvements along Old Columbia Pike was granted a waiver of the impervious cap based on community need and public safety concerns. Likewise, the proposed plan for a sidewalk along Thompson Road was granted a conditional waiver of the impervious cap due to community need and safety concerns. In this case, DPWT did not meet the Planning Board=s recommended condition and also exceeded the ten percent imperviousness limit.

Development projects that have been approved by the Planning Board incorporate forest preservation and planting areas and protection of environmental stream buffers. Some of these projects involve the creation of parkland to provide the needed protection for environmentally-sensitive areas. These new areas of parkland are consistent with the proposed park recommendations of the Cloverly Master Plan, Fairland Master Plan, and the 1995 Limited Amendment to the 1981 Eastern Montgomery County Master Plan. Specifics on parkland acquisition and conservation easements obtained to protect environmentally sensitive areas will be reported in future annual reports.

Of the 30 projects listed in Table 8, a total of 23 final water quality plans have been approved as of February 2001. Several of the projects are in the path of the proposed Inter-County Connector alternative routes. The Maryland State Highway Administration placed one site (Allnut/Peach Orchard Estates), which was under construction, in reservation pending decisions on Inter-County Connector (ICC) alignment alternatives

Table 8. Upper Paint Branch SPA Development Projects (1995 to February 2001)

PROJECT NAME	SPA LOCATION	DEVELOPMENT SIZE, TYPE	STATUS
Allnutt/Peach Orchard Estates	Right Fork Tributary	141 acres, 130 lots, RE-1 cluster option adjoining 2 subdivisions were concurrently reviewed. Includes parkland dedication.	Preliminary and final water quality plans approved. Sediment control permit issued. Project construction started; however, site is now in reservation due to its location in an alternative ICC route.
Bailey Thompson Property	Left Fork Tributary	9.8 acres, RE-1 cluster option, proposed 5 lots includes parkland dedication and acquisition.	Preliminary and final water quality plans approved. Sediment control permit issued. Under construction.
Briarcliff Manor West (Baldi Property)	Right Fork	58.15 acres, 56 lots proposed	Preliminary/Final water quality plans approved, Under construction.
Calvin Williams Subdivision	Good Hope Tributary	1.0 acre	No plan of subdivision. Sediment control permit issued. Overlay zone requirements conditionally waived due to long driveway created by flag lot. Onsite stormwater management to be provided.
Carlton Subdivision (Rose Property)	Right Fork	2.9 acres, R-200	Preliminary/Final water quality plan pending.
Cedar Ridge Community Church (Spencer Farm)	Right Fork	12.3 acres, Proposed church	Preliminary and final water quality plans approved. Sediment control permit issued. Under construction.
Cloverly Safeway	Good Hope Tributary	2.6 acres, C-1 Renovation	Preliminary/Final water quality plans approved. Permit issued. Under construction.
Cloverly Town Center	Good Hope Tributary	3.13 acres, C-1 (0.57 acres in SPA)	Revised preliminary and final water quality plan under review.
Colesville Heights	Left Fork Tributary	0.5 acres, RE-1, 1 lot	Preliminary and final water quality plans approved. Sediment control permit issued.
Davila Residence, Ethel Lee Pell property	Left Fork	2.0 acres, RE-1 1 lot	No plan of subdivision. Meets overlay zone requirements. Construction complete.

Table 8 Continued. Upper Paint Branch SPA Development Projects (1995 to February 2001)

Drayton Farms (Parr:s Ridge)	Left Fork Tributary	63.5 acres, RE-1 cluster option	Preliminary and final water quality plans approved. Permit issued. Under construction.
Fairland Acres	Upper Paint Branch Mainstem	3.7 acres, R-200	Preliminary / final water quality plans approved. Under construction.
Fairland Community Recreation Center	Right Fork	9.8 acres	Construction complete. Awaiting as-built.
Fairland Gardens	Right Fork Tributary	5.9 acres, R-200, 5 lots previously approved, with 3 new lots proposed)	Construction is substantially complete. Awaiting as-built.
Fairland, Freedmans Addition to	Upper Paint Branch, Mainstem	0.4 Acres	No plan of subdivision. Sediment control permit issued. Overlay zone requirements met.
Good Hope Estates	Left Fork Tributary	3.9 acres, RE-1 3 lots	One lot complete, second new lot has not yet started construction.
Good Hope Union United Methodist Church	Good Hope Tributary	7.7 acres, proposed church	Preliminary and final water quality plans approved. Construction complete, As-Built pending.
Harding Subdivision	Upper Paint Branch, Mainstem	2.6 acres, R-200	Preliminary/Final water quality plans approved.
Hardings Subdivision - Parcel 135	Upper Paint Branch Mainstem	1.0 acres, R-200	Preliminary / final water quality plans approved.
Harding's Subdivision, Lot 16	Upper Paint Branch, Mainstem	0.7 acre	Not a plan of subdivision. Sediment control permit issued. Overlay zone requirements waived with conditions due to lot setback requirements in an

			established neighborhood.
Hunt Property - Lions Den	**Right Fork**	**78.7 acres, RE-1**	**Preliminary/ final water quality plans approved.**

Table 8 Continued. Upper Paint Branch SPA Development Projects (1995 to February 2001)

Hunt Property - Miles Tract	Right Fork	48.2 acres, PD-2	Preliminary water quality plan submitted. Review on hold.
Kaplan Property	Right Fork Tributary	2.17 acres, R-200, 2 lots	Preliminary and final water quality plans approved
LaRoe Property	Left Fork	14.4 acres, RE-1 (9.4 acres in SPA)	Preliminary water quality plan withdrawn. Property sold to SHA due to ICC alternative.
Lord Subdivision	Right Fork	1.16 acres, R-200, 3 lots proposed	Preliminary / final water quality plans approved.
Old Columbia Pike Pedestrian Improvements	Upper Paint Branch	0.75 acres, Roadway / Sidewalk	Revised preliminary / final water quality plans approved.
Sines Property	Left Fork	2.5 acres, RE-1, 2 lots	Preliminary / final water quality plans approved.
Snowdens Manor, Enlarged P572	Good Hope Tributary	1.0 acre	No plan of subdivision. Sediment control permit issued. Overlay zone requirements met.
Spencerville Post Office	Right Fork	3.9 acres, RE-1 Proposed U.S. Post Office	Preliminary and final water quality plans approved. Construction completed.
Thompson Road Sidewalk	Left Fork	0.5 acres	Preliminary / final water quality plans approved. Construction completed.
Tofigh Property	Mainstem	1.8 acres, R-200	Preliminary / final water quality plans approved.
Snider's Estates	Left Fork	8.1 acres, RE-1	Preliminary / final water quality plans approved.

4.2.4 Summary of BMP Monitoring in the Upper Paint Branch SPA

There are three construction projects in the Upper Paint Branch SPA that are currently submitting BMP monitoring data (Table 9). Two of these, Fairland Community Center and Briarcliff Manor, are well into the construction phase. The other one, Hunt/Lions Den, has not begun construction but has submitted pre-construction baseline data that will be used at a later date to measure the effectiveness of BMP=s.

Table 9. Paint Branch BMP Monitoring

PROJECT NAME & CONSULTANT CONDUCTING THE MONITORING	REQUIRED BMP MONITORING	REQUIRED TIME FRAME FOR BMP MONITORING	DATA SUBMITTED THUS FAR
Peach Orchard-Allnut / Biohabitats ***(construction halted with SHA take over of the site)***	**4 groundwater observation wells** *water level* **2 stream flow loggers** **1 rainfall logger** **2 continuous temperature loggers** **surface water quality** *pH, Conductivity, Dissolved Oxygen* **embeddedness**	**pre-development monitoring:** 1 year **during construction monitoring:** until entire project is stabilized and all sediment control measures are removed **post-construction monitoring:** 2 years	**groundwater data:** 7/96 -1/98 **stream flow data:** 7/96 - 1/98 **rainfall data:** 7/96 - 1/98 **temperature data:** 7/96 - 1/98 **surface water quality data:** 7/96 - 1/98 **Embeddedness data:** 7/96 - 1/98
Fairland Community Center / Environmental Quality Resources, Inc. *(Construction began 6/99)*	**3 continuous temperature loggers** **2 groundwater wells** **photo documentation of bioretention area and annual survey of plant species**	**pre-development monitoring:** 1 year **during-construction monitoring:** until site is stabilized and sediment pond is converted to SWM pond **post-construction monitoring:** 3 years	**temperature data:** 3/98 - 9/98 6/99 - 9/99 6/00 - 9/00 **groundwater data:** 3/98 - 12/00

Table 9 Continued. Paint Branch BMP Monitoring

Briarcliff Manor West (formerly Baldi Property) / Environmental Systems Analysis, Inc. ***(construction began 8/99)***	**1 groundwater observation well** **2 surface water quality stations:** *pH, Conductivity, Dissolved Oxygen, Turbidity* **3 continuous water temperature loggers** **1 continuous air temperature logger** **2 embeddedness stations** **channel cross section** **1 stream flow logger**	**pre-development monitoring :** 1 year **during-construction monitoring:** until site is stabilized with functioning stormwater management facilities **post-construction monitoring:** 1 year	**groundwater data:** 9/98 - 12/00 **surface water quality data:** 9/98 - 12/00 **temperature data:** 9/98 - 9/00 **embeddedness data:** 9/98 - 1/01 **channel cross section data:** 9/98, 10/99, 4/00 **stream flow data:** 11/98 - 12/99
Cloverly Safeway *((under construction)*	**1 continuous water temperature logger** **water quality:** Cadmium, Copper, Lead, Zinc, Hydrocarbons	**Pre-Construction:** 3 storms, Temperature. **During construction:** No monitoring **Post-Construction:** 3 storms per year for 5 years, Temperature.	**temperature data:** 9/98 **water quality data:** 5 storms 9/98-11/99
Hunt Lions Den / Environmental Systems Analysis, Inc.	**2 groundwater wells** **2 continuous water temperature loggers** **2 surface water quality stations:** *pH, Conductivity, Dissolved Oxygen, Turbidity* **5 stream channel cross sections**	**pre-development monitoring:** 1 year **during-construction monitoring:** until site is stabilized and sediment pond is converted to SWM pond **post-construction monitoring:** 3 years	**groundwater data:** 8/00 - 1/01 **temperature data:** 8/00 - 9/00 **water quality data:** 8/00 - 9/00 **stream channel cross sections:** 9/00

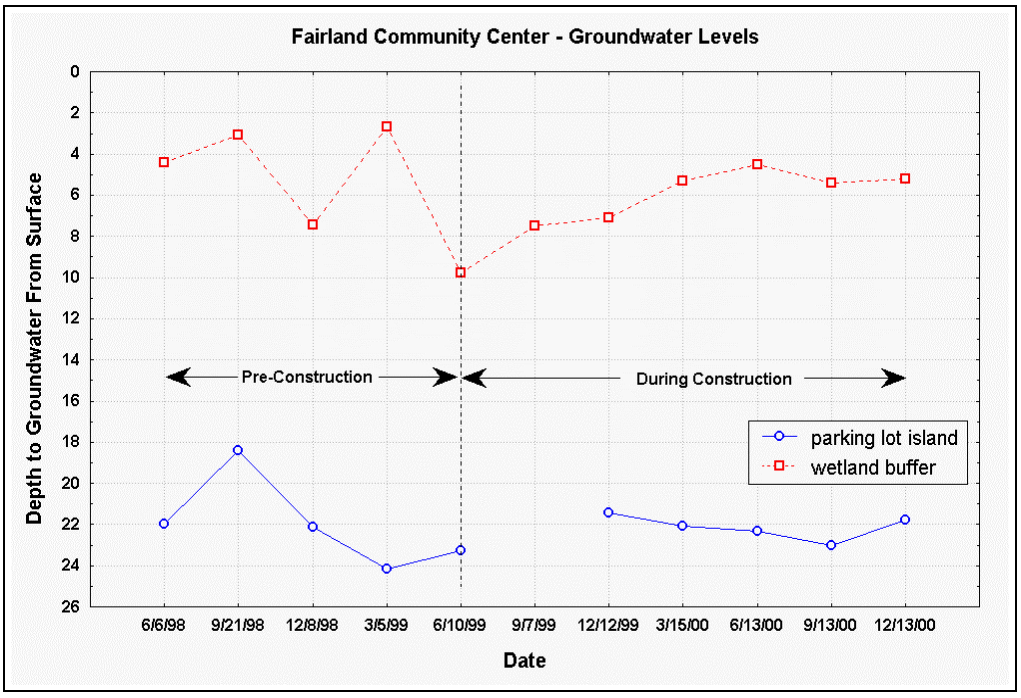
Fairland Community Center

BMP monitoring at Fairland Community Center includes two groundwater wells and continuous water temperature readings from three locations. The objective of the groundwater monitoring here is to evaluate the degree to which groundwater levels drop in response to impervious surfaces (buildings and parking lots) added to the site. Monitoring began in June of 1998 and construction began in June of 1999 which allowed enough time to get one full year of pre-development data. One groundwater well at the Community Center is located in a parking lot island. The other well is outside the limit of disturbance in a wetland buffer. The US Geological Survey (USGS) has maintained a nearby well on Fairland Road at Route 196 (Old Columbia Pike) since 1955 which will be used as a control. The USGS well is on a hillside. Data from the BMP monitoring well in the parking lot can be compared to the USGS well which has a much longer

history. This permits us to relate data from the Community Center well to long term trends in groundwater levels. It is probably best not to compare the USGS well to the wetland well because of the great difference in their topographic settings.

Data from the two wells is graphed in Figure 23. During the pre-construction period from June 1998 through May 1999 average depth to groundwater was 5.5 feet in the wetland buffer well and 22.0 feet in the parking lot island well. The USGS well at Fairland Road was unusually low during this period. Construction began at the Community Center site in June 1999 and is still under way. Over the entire construction period, average groundwater depths are very slightly lower; 5.8 feet in the wetland buffer well and 22.1 feet in the parking lot island well. Over the same period, water levels at the USGS Fairland Road well increased into normal ranges.

The wetland well indicates low groundwater levels during the drought of 1999 (6/99) followed by a steady recovery. Water levels in the parking lot well reached a low in 3/99 which is odd considering this is typically the wettest time of the year. Also, there is very little recovery from low levels reached during 1999 in comparison to both the wetland well and the USGS control well. This suggests that construction activities in the parking lot area may already be hampering groundwater recharge there. As part of the site design for this project, ›clean‹ rooftop runoff is to be infiltrated into the ground along the back side of the building to compensate for the lost ability to recharge groundwater.



Continuously recording water temperature loggers are deployed in the stream receiving runoff from the Fairland Community Center. Findings from this monitoring indicate that water temperatures, during summer months, are frequently above the sixty-eight degree standard for Use III streams (Figures 24, 25 and 26). Water temperatures were over the 68 degree standard 63% of the time they were monitored during the last three summers. Temperatures frequently exceeded the standard for long continuous periods of time also. In 1999 temperatures were over the standard for a continuous period that exceeded 19 days. This was a drought year however. The longest continuous period over the standard exceeded eight days in 1998. Temperatures were above the standard for a continuous period of over eight days in 2000 also. Maximum temperatures were 75.3 degrees in 1998, 81.7 degrees in 1999 and 80.6 degrees in 2000. Average water temperatures during 1998, 1999 and 2000 were 67.4 ^{O}F, 71.9 ^{O}F and 70.1 ^{O}F respectively. Water temperatures have been higher for two years following the pre-development monitoring of 1998. Summer of 1999 was very hot and dry which would explain the warmer temperatures. However, summer of 2000 was relatively cool and wet but average temperature was still three degrees warmer then 1998.

Temperature patterns like these can be stressful to trout. This is especially true when temperatures do not drop below 68 degrees Fahrenheit at some point daily. A daily period of time during which temperatures are below 68 degrees is necessary for trout to meet life requisite needs including feeding. When temperatures exceed 68 degrees for a limited portion of a day, trout are still stressed but can maintain themselves during periods of the day when temperatures are below 68 degrees. However, it is unlikely that trout would move as far up a small tributary as the temperature logger at this site.

Trout are found in the right fork of Paint Branch above and below where this tributary enters the stream. If the water in this tributary does not cool off before it enters the right fork of Paint Branch, it could potentially have negative effects on trout. Warmer water temperatures during construction may be from the sediment pond which holds water for extended periods of time. It will not be until after the sediment pond is converted to a water quality pond that an assessment of BMP performance can be made regarding temperature impacts.

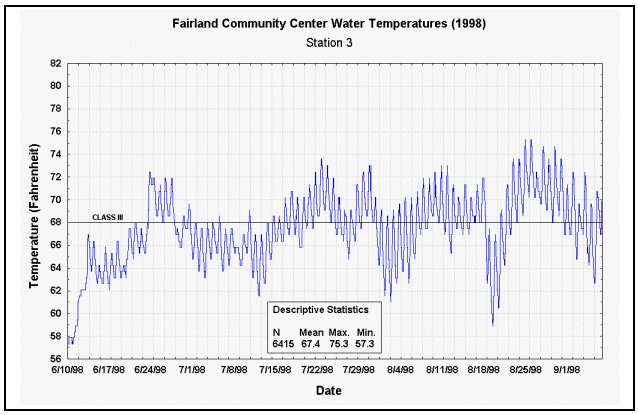


Figure 24. Water Temperatures from Fairland Community Center During 1998

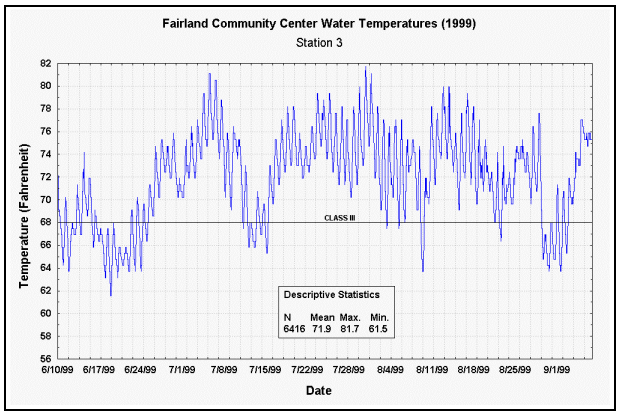


Figure 25. Water Temperatures from Fairland Community Center During 1999

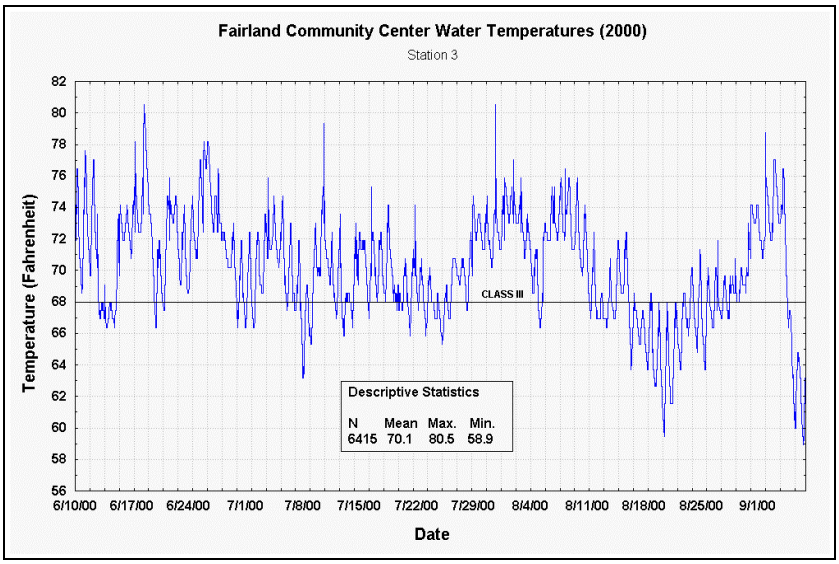


Figure 26. Water Temperatures from Fairland Community Center During 2000

Briarcliff Manor West

BMP monitoring at Briarcliff Manor West includes one groundwater observation well, water quality readings from two locations in the receiving stream, three water temperature loggers, survey of stream channel cross section at one location and stream flow. This monitoring began in September of 1998, construction began in August of 1999.

All groundwater readings taken from the observation well thus far are plotted in Figure 27. As can be seen in the graph groundwater levels reached a low point during the period of June - August, 1999. This is related to drought conditions experienced throughout the region during this period. For the pre-construction period (1/99 - 8/99), average groundwater level was 6.8 feet, while the during construction period (1/2000 - 8/2000), averaged 5.4 feet. Again, lower groundwater readings during the pre-construction period are due to drought conditions.

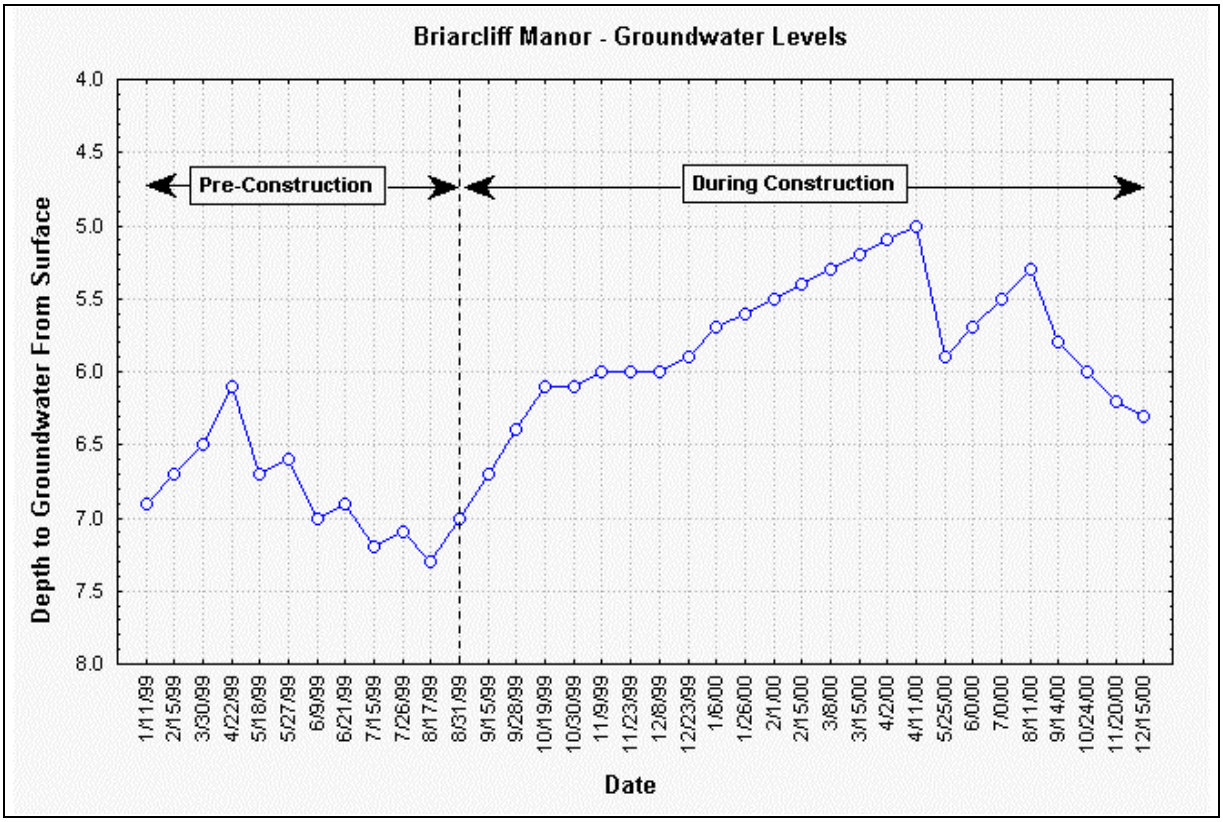


Figure 27. Groundwater Readings from Briarcliff Manor

Embeddedness readings are taken in the receiving stream, above and below the main sediment pond outfall. The purpose of this monitoring is to evaluate the effectiveness of sediment control during construction. Embeddedness readings taken thus far are presented in Figure 28. The figure indicates that observations were similar at both stations. There are however, periods when readings from the downstream station are slightly higher. However, the small difference in percent embeddedness is considered minor given the relatively subjective nature of the visual observation technique of the embeddedness test. The figure reveals that embeddedness did not greatly increase below the site during construction, suggesting that sediment controls on the site are keeping most of the sediment out of the stream.

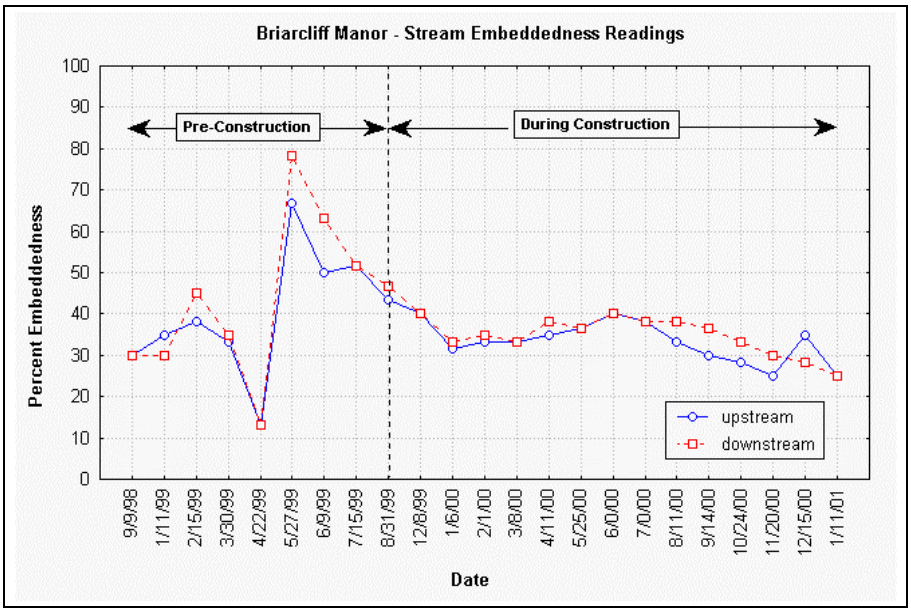


Figure 28. Embeddedness Readings from Briarcliff Manor

Water quality readings (dissolved oxygen, pH, conductivity, temperature) are taken at the same two locations as embeddedness. The purpose of this monitoring is to determine if water quality is impacted by outfall from the stormwater management pond. Dissolved oxygen data obtained thus far are presented in Figure 29. Dissolved oxygen levels dropped below the State of MD criteria of 5.0 mg/L during August of 1999. Low dissolved oxygen readings taken here and at other locations in the Paint Branch watershed during this period are considered drought related. Other water quality parameters (pH, conductivity) have shown no difference, either between stations or before and during construction.

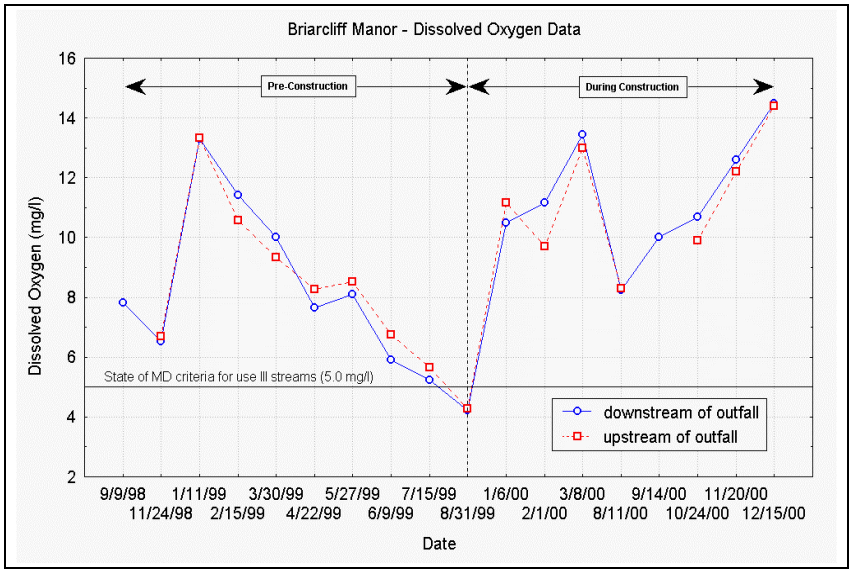


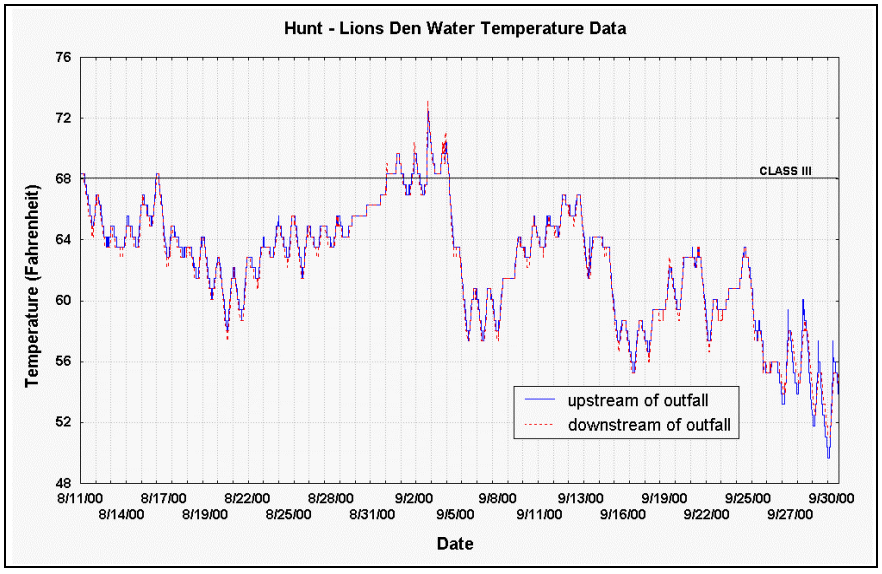
Figure 29. Dissolved Oxygen Readings from Briarcliff Manor

Hunt/Lions Den

BMP monitoring at Hunt/Lions Den includes two groundwater wells, water quality readings from two locations (upstream and downstream of SWM outfall), stream channel cross section surveys at five locations. Pre-construction monitoring began in August of 2000. Construction has not yet begun. Some pre-construction water temperature data is presented in Figure 30. As can be seen in the graph, there is very little difference in water temperature between the two locations. Future data will be evaluated to determine if this trend holds up after installation of the SWM pond.

4.2.5 Summary of Stream Monitoring in the Paint Branch SPA

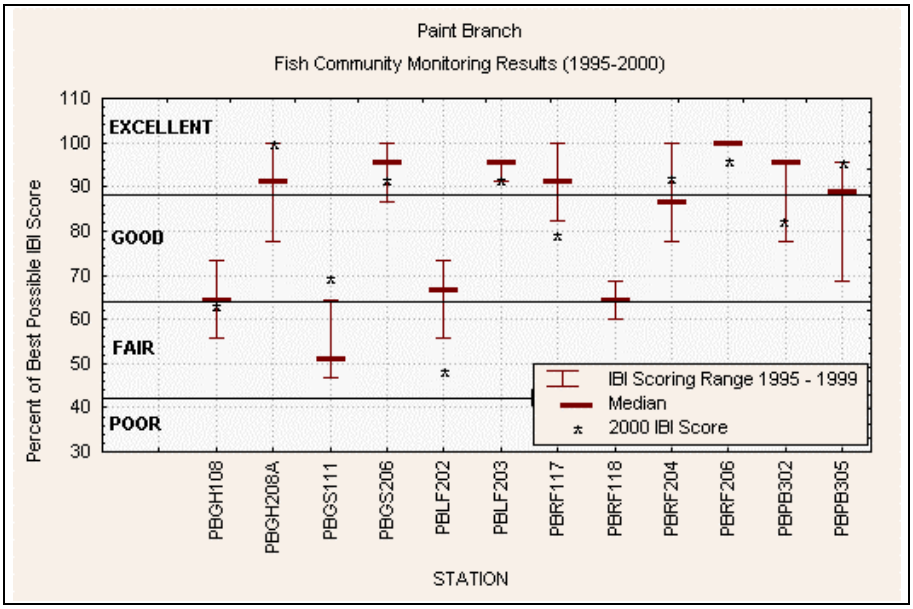
Baseline stream monitoring began in 1994 and is done on an annual basis at most stations throughout the Paint Branch SPA. Monitoring in 2000 was completed at 17 stations and shows the extent of impact that drought conditions during 1999 had on the streams ecology. In general, the drought of 1999 did not have as much of an impact on Paint Branch, in comparison to other SPA:s. This may in part be due to the spring fed nature of the streams in this area. In the past these streams have had cool baseflows that moderate high summer temperatures. Quantitative habitat surveys were completed at five stations and continuous temperature loggers were



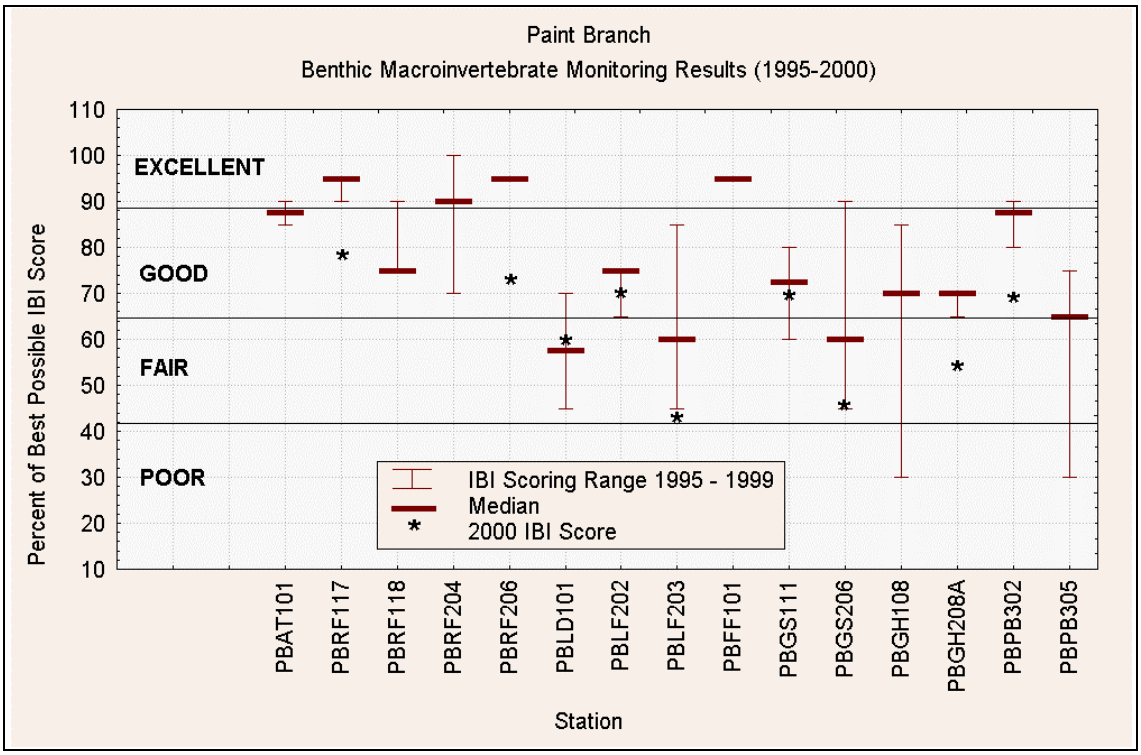
deployed at eleven stations.

4.2.5.a Biological Monitoring Results

Fish sampling was completed at eleven stations during 2000. Results (Figure 31) suggest that the drought of 1999 had little impact on the fish community as a whole. However, numbers of Brown Trout adults and young-of-year were lower throughout the watershed. The Right Fork was particularly hard hit as Brown Trout were absent from all stations sampled (PBRF117, PBRF204 and PBRF206) for the first time since monitoring began in 1994. The rest of the fish community has remained intact. Because the IBI is meant to indicate the status of the fish community as a whole, the lack of Trout alone does not affect IBI scores greatly. IBI values at these three Right Fork stations remain comparable with previous years (Figure 31). Two stations (PBRF117 and PBLF202) experienced declines in IBI scores due to lower numbers of fish species that occupy the riffle habitat. These two stations are located in the upper portions of the Right Fork and Left Fork where stream flows were down to a trickle during the summer of 1999.



Sampling for benthic macroinvertebrates was completed at thirteen stations along the Paint Branch during spring of 2000. Benthic marcoinvertebrates have been identified and results from nine stations are available for inclusion in this report. Six of these nine stations had IBI scores which were lower then all five previous years of monitoring (Figure 32). Low IBI scores from throughout the watershed are likely the result of drought impacts from the previous summer of



1999. Low water levels can expose shallow areas thus reducing the amount of habitant for benthic organisms. At low flows temperatures can also increase which results in lower concentrations of dissolved oxygen in the water. Both high temperatures and low dissolved oxygen concentrations can negatively impact benthic macroinvertebrates. Three stations (PBLD101, PBGS111 and PBLF202) were within the range of IBI scores from previous years. The benthic macroinvertebrate community in these three areas (upper right fork, upper Gum Springs and upper Left Fork) were apparently not impacted by the drought.

Figure 32. Results of Benthic Macroinvertebrate Monitoring in the Paint Branch SPA.

In last years SPA annual report, benthic macroinvertebrate results from upper Good Hope (PBGH108) indicated that a significant decline in community integrity had occurred between the spring of 1997 and 1998. Subsequent monitoring in1999 indicated that the benthic macroinvertebrate community had recovered to pre-1998 condition. The cause of this decline is not well understood and, apparently, was short lived. Results from 2000 are not yet available for this report but will be included as a supplement as soon as they are available.

In two tributaries (Left Fork and Gum Springs), the benthic macroinvertebrate community has consistently shown a higher degree of impairment in an upstream to downstream fashion. In the Left Fork, for example, station PBLF202 (located in the upper reaches, near Good Hope Rd.) has maintained a benthic community that consistently rates in the good range. However, downstream at station PBLF203 condition of the benthic community is much more variable from year to year and averages out in the fair range. Monitoring results from 2000 found the benthic macroinvertebrate community to be holding steady in the ›good‹ range at station PBLF202 while downstream at station PBLF203 declined further into the ›poor‹ range.

DEP, after investigating potential impacts between the two sites, has found two sources of impairment. One is a small tributary draining a residential neighborhood on the east side of the Left Fork near Maydale Nature Center. In 1999, DEP conducted an investigation on this tributary after discovering oil in the stream at station PBLF203. The investigation determined that oil was present in both the sediment and water and that the source was a leaking home heating oil tank that had been removed from a private residence in February of 1999. The heating

oil was flushing out with groundwater into the storm drain system and out-falling into the small tributary which led to the Left Fork. It was determined at this time (July, 1999) that the benthic macroinvertebrate community declined significantly in the Left Fork immediately downstream from the confluence with this tributary. It was discovered during the investigation that Maryland Department of the Environment was aware of this incident and deployed oil boons in the storm water outfall while the heating oil tank was removed. Contaminated soil around the tank was also removed and it was determined that everything that could reasonably be done to stop the slow flushing of oil from this site had been done. Residual oil from the site may still be getting into the storm drain system and into the Left Fork

The other possible source of impairment in this area of the Left Fork comes from the Rainbow Dr. tributary which flows into the Left Fork at a location just upstream of the Maydale Nature Center. A temperature study conducted in this area concluded that although mean water temperatures were not higher, brief spikes as high as 85 degrees F. occurred at a location immediately downstream of the confluence with Rainbow Dr. tributary (see 2000 SPA annual report). The temperature spikes did not show up further downstream on the Left Fork below Maydale Nature Center, suggesting that a brief pulse of warm water from the Rainbow Dr. tributary is quickly attenuated as mixing with the higher flowing Left Fork occurs. Therefore, thermal impact from the Rainbow Dr. tributary is probably not a significant source of impairment in the Left Fork at station PBLF203.

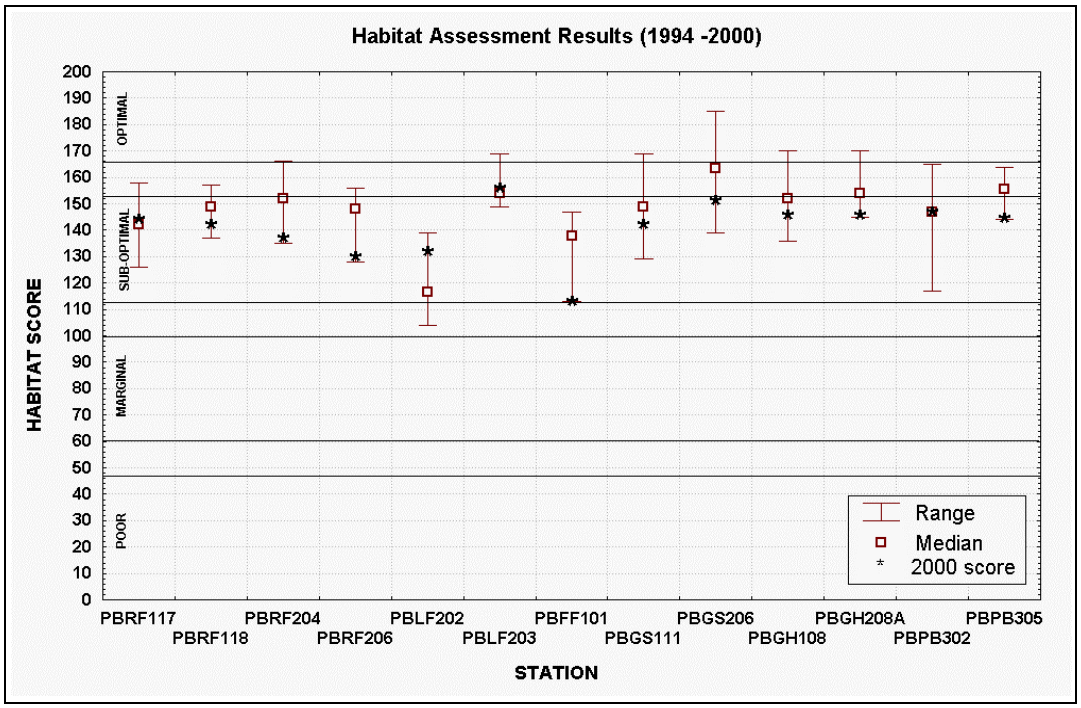
Monitoring results from Gum Springs tributary also show increased impairment of the benthic macroinvertebrate community in the lower reaches (PBGS206). Upstream at station PBGS111 the benthic community experiences less year to year variability and averages out in the ›good‹ range while downstream at station PBGS206 there is greater variability with an average IBI rating in the ›fair‹ range. At this time it is thought that thermal impacts from the Oak Springs regional stormwater pond is the primary cause of declining conditions in the benthic macroinvertebrate community in lower Gum Springs (PBGS206). DEP and the U.S. Army Corps of Engineers have worked together in mitigating this problem by installing a by-pass pipe that carries warm water baseflow discharge from the pond to the mainstem of Paint Branch. Preliminary studies have shown that water temperatures are reduced between the pond and the outfall at Paint Branch mainstem (see section 4.2.6.c). Future monitoring results will determine if this leads to some improvement in the benthic macroinvertebrate community in lower Gum Springs.

4.2.5.b Habitat Monitoring

Rapid Habitat Assessment

Results of all habitat assessments done in Paint Branch are summarized in Figure 33. Habitat scores have generally remained in the sub-optimal range at all stations. This means that overall habitat conditions are adequate to support a diverse biological community. However, problems can and do still exist with various parameters of the stream habitat. As mentioned in last years SPA Annual report, the headwaters of the Left Fork subwatershed, above Maydale Nature Center (PBLF202) lack good stream buffer areas in some places. Although the land adjacent to the

stream is in public ownership, area landowners are in the habit of mowing to the banks of the streams and dumping yard waste and trash on the banks (photos 7 and 8).



Review of individual habitat parameters evaluated during 2000 indicate that the amount of in-stream sediment has increased in comparison to previous years in two areas of Paint Branch. These include the Right Fork and Fairland Farms Tributary (PBFF101). BMP monitoring at the Briarcliff Manor construction site (on the Right Fork) has identified a gully draining an adjacent subdivision that is actively eroding. Streambanks in the vicinity were also identified as unstable and eroding. BMP monitoring has also produced embeddedness values that are slightly higher below the Briarcliff site than just above it (Figure 28). The increase in embeddedness at the Briarcliff site and increased sediment in the Right Fork are likely a result of construction activities and streambank erosion. No other habitat parameters received lower scores in 2000.

Public Land Encroachment Issues

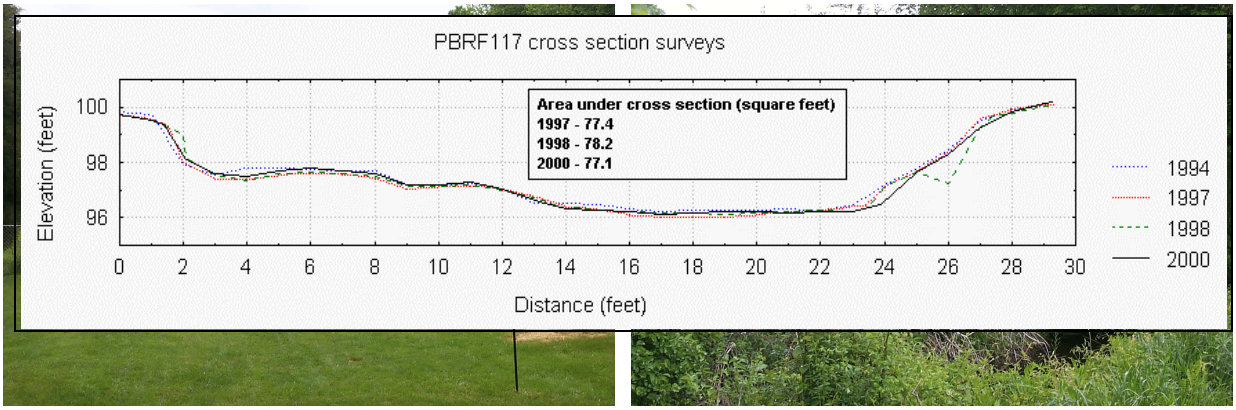
There are two areas in the Paint Branch SPA (Gum Springs and upper Left Fork) where encroachment by private property owners into public lands that run along the stream corridor is impacting the quality of stream condition. Along sections of both the Gum Springs tributary and the Left Fork, residents are mowing the flood plain and piling lawn debris and trash along stream banks, thus inhibiting the growth of beneficial stream side vegetation (photos 5 thru 8). Reforestation and prevention of encroachment and dumping would greatly improve the situation in these areas. DEP will consult with M-NCPPC to identify how to best handle these issues.

Photo 5. Lawn mowing within public land along Gum Springs tributary

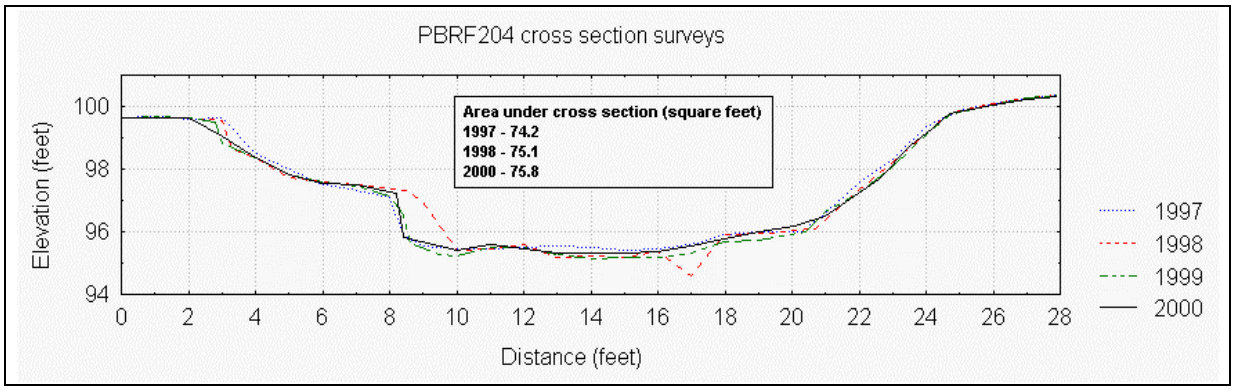
Photo 6. Lawn debris piled along banks of Gum Springs tributary

Photo 7. Lawn mowing within public land along the Left Fork of Paint Branch

Photo 8. Lawn debris piled along banks of the Left Fork of Paint Branch

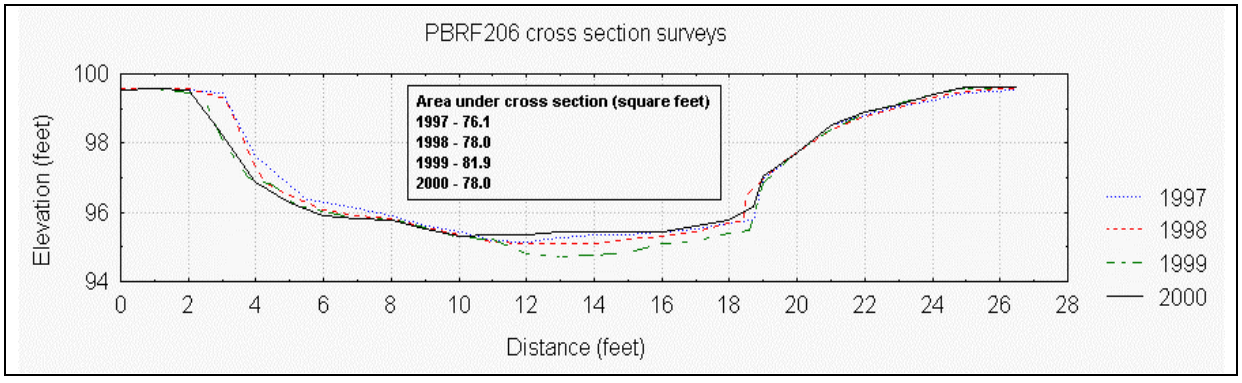


Stream Channel Morphology Monitoring

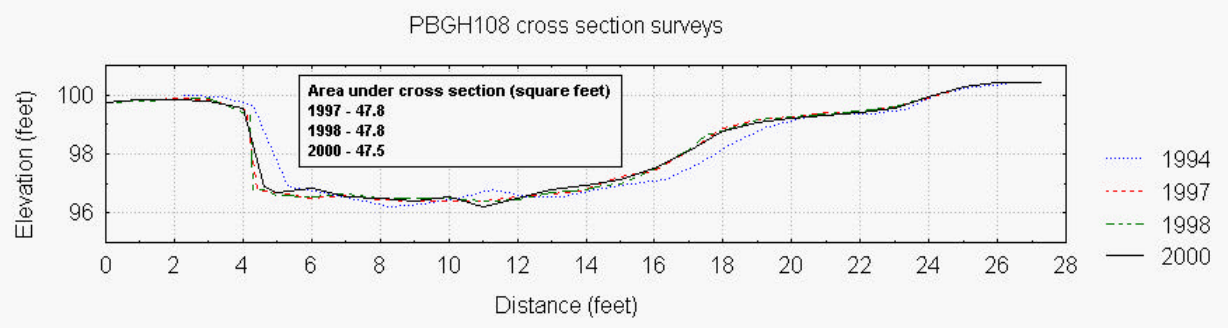


Quantitative habitat assessments were completed at five stations in the Paint Branch SPA during 2000. Among other parameters, this monitoring involves surveying the stream channel cross section over time to determine if channel widening or deepening is occurring in response to new development in the watershed. Values for cross sectional area (area under survey line) of the stream channel are calculated from these surveys. Other more semi-quantitative measurements of stream habitat obtained during the quantitative habitat assessment include: Percent of riffle / pool / run habitat within a 75 meter stream segment, percent vegetative cover on stream banks, height of stream banks, embeddedness, max pool depth and particle size distribution in the riffles, entrenchment and width to depth ratios.

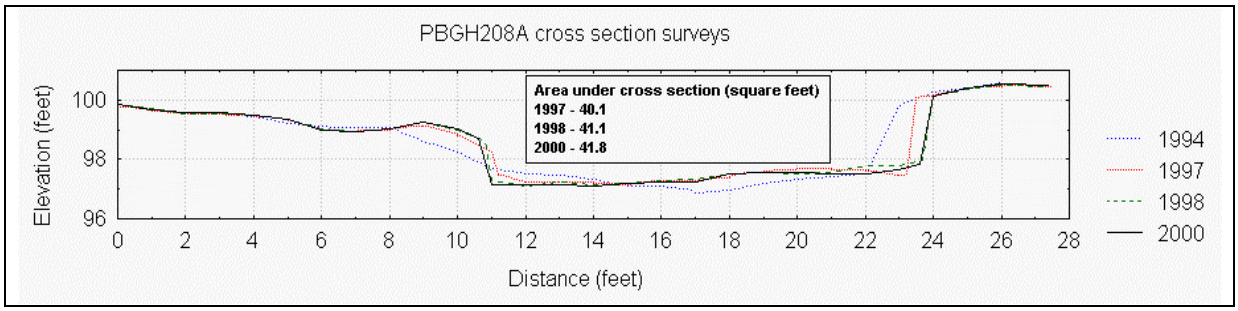
The plotted stream channel cross section from station PBRF117 (Figure 34), located in the upper reaches of the Right Fork, indicates the stream channel is stable in this area. Downstream at stations PBRF204 and PBRF206 (Figures 35 and 36) plotted cross sections indicate that some minor widening of the stream channel has occurred over the last four years at these sites. A small portion of the left bank has eroded away at both sites. A small amount of material has been deposited in the lower portions of the channel at both sites also. This erosion and deposition may be part of the reason for increased sediment documented at these stations in 2000.


PBRF206 cross section surveys
Area under cross section (square feet)
1997 - 76.1
1998 - 78.0
1999 - 81.9
2000 - 78.0
Elevation (feet)
100
98
96
94
0
2
4
6
8
10
12
14
16
18
20
22
24
26
28
Distance (feet)
1997
1998
1999
2000

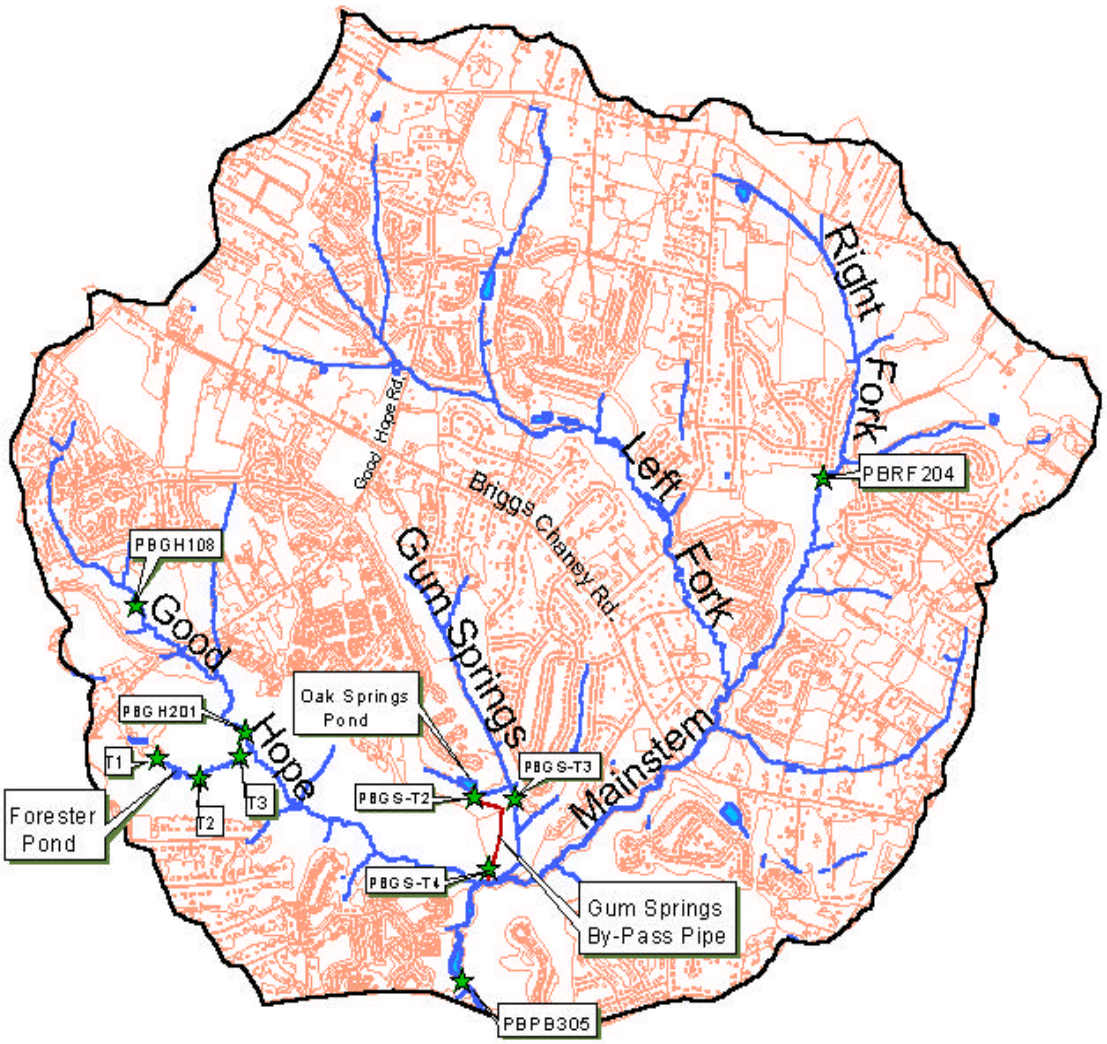
Quantitative habitat was completed at two stations on the Good Hope tributary where higher rates of stream channel erosion had been documented in a previous SPA report. Plots of stream channel cross sections from these two stations are presented in Figures 37 and 38. Although some change in channel dimensions can be seen at both of these stations during previous years, very little change occurred between 1998 and 2000. This is reflected in channel cross sectional areas at these sites that have changed little in recent years.



4.2.5.c Stream Temperature Monitoring

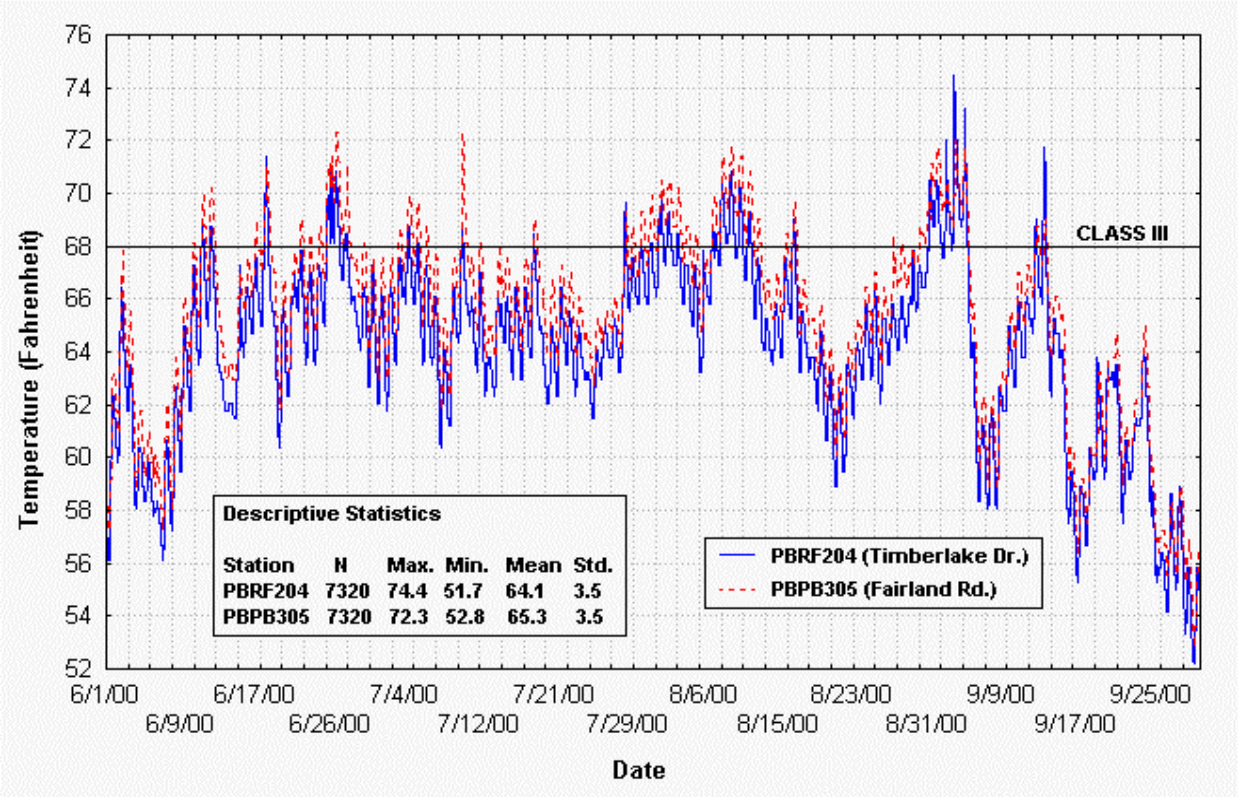


Continuous temperature loggers were deployed at ten stations in Paint Branch SPA during the summer of 2000 (Figure 39). There were three loggers placed in the Gum Springs watershed and 5 loggers placed in the Good Hope watershed. One logger was deployed in the Right Fork. One logger was deployed in the Mainstem.


Right Fork
Left Fork
Gum Springs
Mainstem
Good Hope
Good Hope Rd.
Briggs Chaney Rd.
PBRF204
PBGH108
PBGH201
Oak Springs Pond
PBGS-T3
PBGS-T2
PBGS-T4
T1
T2
T3
Forester Pond
Gum Springs By-Pass Pipe
PBPB305

Right Fork and Mainstem Temperature Monitoring Results

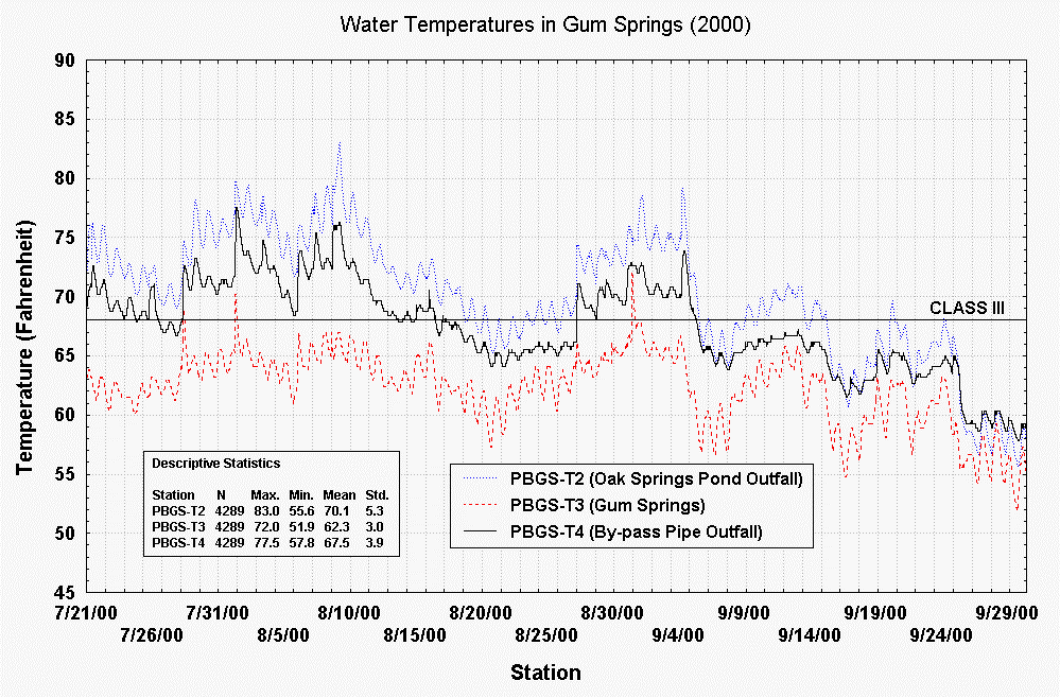
The summer of 2000 was generally cooler and wetter then previous summers resulting in lower water temperatures. At station PBPB305, for example, average summer water temperature was one degree (F) warmer in 1998 then in 2000. In 2000 temperature loggers were deployed in the Right Fork (PBRF204) and the mainstem just upstream of Fairland Rd. (PBPB305). Results presented in Figure 40 show how similar water temperatures are at these two stations. Mean temperatures for the summer at the two stations are 1.2 degrees apart. Water temperatures that remain as cool in the lower mainstem as the headwater areas is a primary reason why Paint Branch supports a naturally reproducing population of Brown Trout. Results from 2000 indicate that this condition is still being met.



Gum Springs Temperature Monitoring Results

The Oak Springs Pond had been identified as an area where warm water discharge was creating a

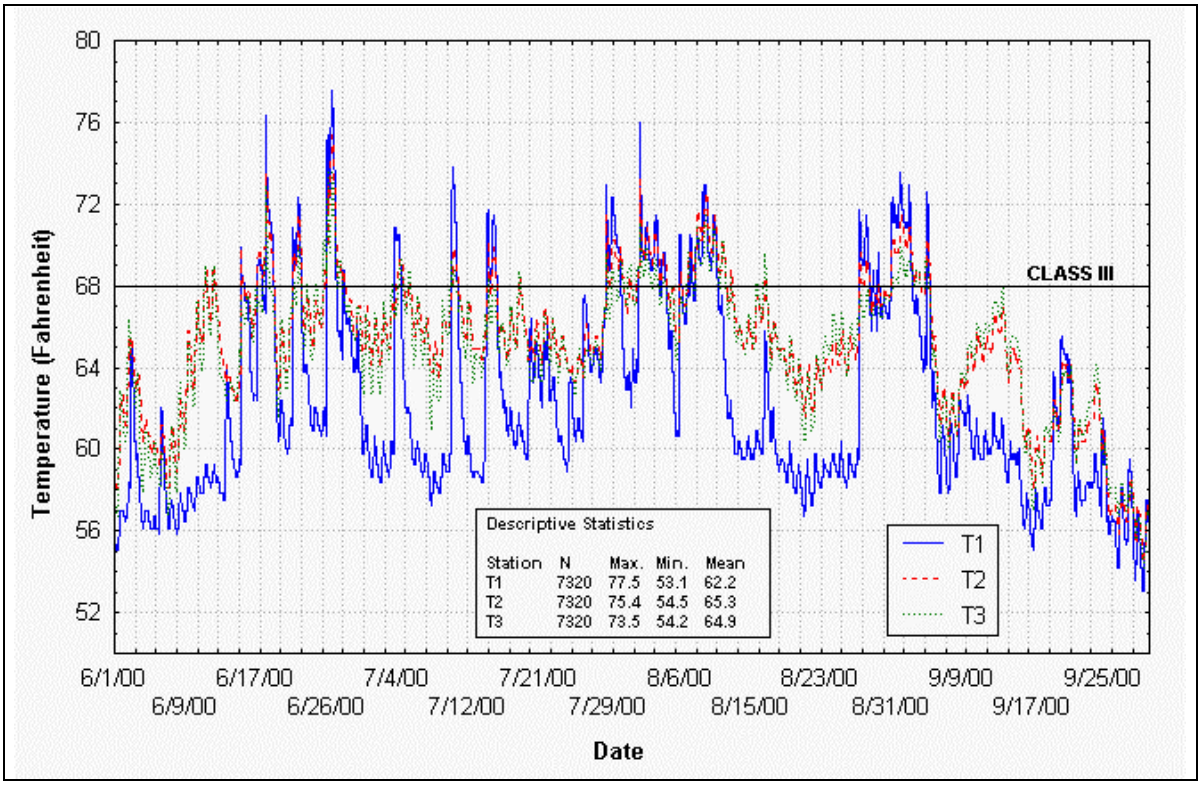
thermal impact on the receiving stream. DEP developed a project to mitigate thermal impacts from this pond which was installed during 2000. The Gum Springs Bypass project (completed in mid July 2000) involves by-passing warm water baseflow from the pond to the mainstem of Paint Branch. This accomplishes two things: 1) warm water from the pond is cooled as it is conveyed through an underground pipe approximately 1,900 feet to the Paint Branch mainstem and 2) peak storm flows are reduced in Gum Springs as some storm water is routed directly to the Paint Branch mainstem. Temperature loggers were deployed July 21, 2000 at three locations to monitor this project. Logger T2 was at the Oak Springs Pond outfall, before the water entered the by-pass pipe. Logger T3 was in Gum Springs, downstream of the confluence with Oak Springs Pond Tributary. Logger T4 was at the Gum Springs Bypass pipe outfall. Figure 39 on page 62 shows the locations of these loggers. Results are presented in Figure 41. Between the pond outfall (PBGS-T2) and the by-pass pipe outfall (PBGS-T4) mean water temperatures were lowered by 2.6 ^{0} F and the maximum water temperature entering the pipe was lowered by 7.0 ^{0} F. We cannot say at this point what difference the project had on Gum Springs temperatures. We need information on temperatures in Gum Springs upstream of the Oak Springs Pond tributary to make such a determination. We had a second logger installed in Gum Springs upstream of the confluence with the Oak Springs Pond tributary but it failed to produce usable data. We will be reinstalling temperature loggers in this area in 2001. We should be able to determine the effect on Gum Springs from data gathered in 2001.



Colesville Depot Tributary Temperature Monitoring Results

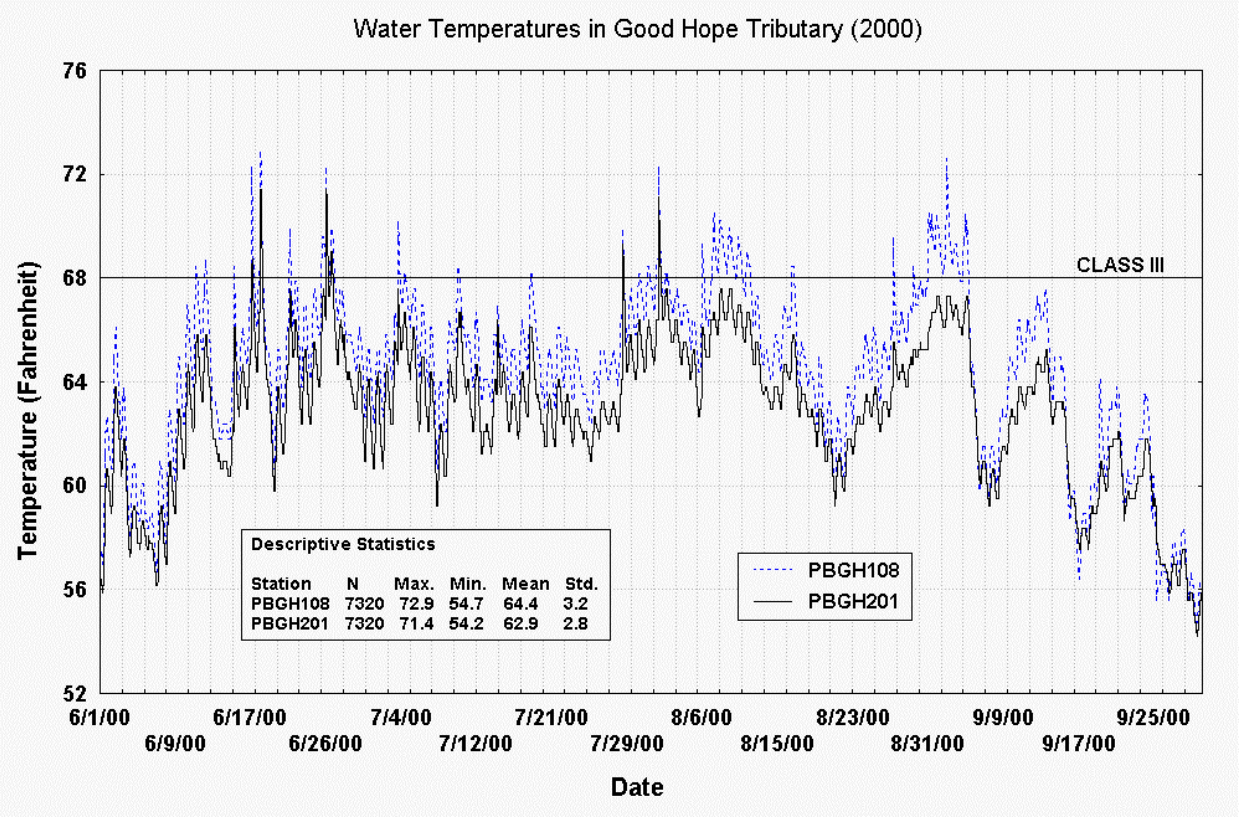
The Forester Pond (Good Hope sub-watershed) has also been identified as a source of thermal impacts. The Forester pond project (completed in late September 2000) involves lowering an old farm pond which DEP had, during previous years of monitoring, identified as a thermal impact to the Colesville Depot Tributary.

Three temperature loggers were deployed in the Colesville Depot Tributary to further document thermal impact from the Forester Pond (Figure 39). Warm water baseflow discharge from the pond has been found to elevate temperatures in the Colesville Depot Tributary by an average of 4^0F in 1996, 6^0F in 1999 and 3^0F in 2000 (Figure 42). DEP has developed plans to lower the pond depth and convert it to a wetland. The project was not completed until late September 2000. Therefore, we are unable, at this time, to determine how successful the project is at reducing water temperatures in the Colesville Depot Tributary. Temperature loggers will be deployed during the summer of 2001 to determine if the project was successful in this regard.



Good Hope Tributary Temperature Monitoring Results

Two temperature loggers were deployed along the mainstem of Good Hope Tributary to determine if any thermal impact exists in upper reaches of this tributary. Results of this monitoring, presented in Figure 43, show that water temperatures are lower at station PBGH201 then PBGH108 which means there are no thermal impacts between these two stations.



4.3 Piney Branch Special Protection Area

4.3.1 Description of the Piney Branch SPA Watershed

The Piney Branch watershed was designated as an SPA because of the intensive development planned for the area including the Traville project, and the existing high water quality found in the watershed. SPA designation was done by County Council resolution on October 24, 1995. The Piney Branch watershed, a subwatershed of Watts Branch, is located in south-central Montgomery County just west of the city of Rockville. Piney Branch originates just to the north of Shady Grove Rd. and east of Travilah Road (Figure 44). From its headwaters, Piney Branch flows to the south entering Watts Branch just south of Glen Road. The SPA includes all 2400 acres of the Piney Branch watershed.

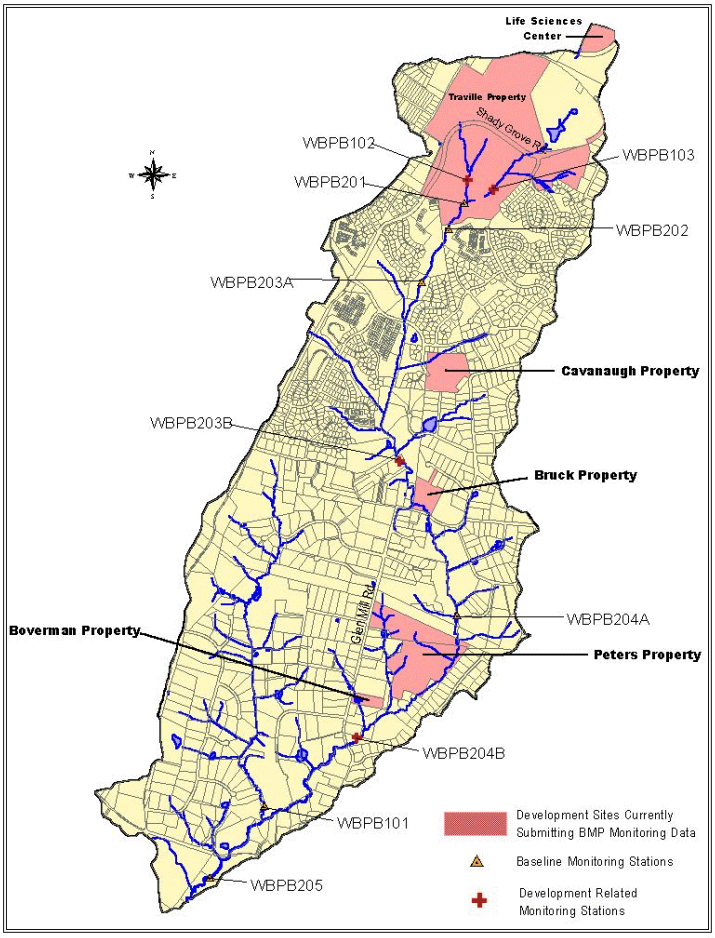
Prior to 1990, the Piney Branch watershed consisted of a mix of agricultural land uses and large lot (1-2 acre) single family homes with some commercial and office development. In early 1993, residential construction began in the headwaters area of Piney Branch on the Willows of Potomac and Piney Glen Village, two large residential subdivisions. No SPA requirements were placed on these projects since they predated the SPA designation. As these projects use stormwater controls that lack the redundancy required in SPA's we anticipate that they may have negative impacts on water quality in Piney Branch SPA. In mid 1994, construction began in the Piney Branch stream valley on a sanitary sewer line from the Watts Branch up to the headwaters of Piney Branch.

4.3.2 Status of Development in Piney Branch SPA

Eleven final water quality plans have been approved for this SPA (Table 11). There are several other projects in various stages of the planning and development process. Also, several developments had been approved prior to SPA designation that are still in the development process. The cumulative impacts of these projects will add to the difficulty in identifying sources of impairment. This is being mitigated on projects currently under construction by strict adherence to approved standards and by innovative stormwater management techniques. All new development will have to adhere to more stringent SPA requirements.

Although the Piney Branch watershed has experienced an increase in development activity over the last couple of years, the majority of the proposed development is for single family homes on lots ranging from one half acre to over two acres in size. One notable exception is the proposed Traville site. This site is 192 acres of mixed-use development within the headwaters of the Piney Branch.

The Traville development is proposing a retail center, apartment buildings, a day care center, various multi-family dwelling units, a research and development campus for Human Genome Sciences and additional research and development areas for future development. This project will present a considerable challenge in maintaining water quality due to the inherently high percentage


Life Sciences Center
Traville Property
Shady Grove Rd
WBPB102
WBPB103
WBPB201
WBPB202
WBPB203A
Cavanaugh Property
WBPB203B
Bruck Property
Glen Mill Rd
WBPB204A
Boverman Property
Peters Property
WBPB204B
WBPB101
WBPB205
Development Sites Currently Submitting BMP Monitoring Data
Baseline Monitoring Stations
Development Related Monitoring Stations

of impervious area that accompanies this type of development. The developers of Traville had originally agreed to limit the overall site imperviousness area to 35%, however that number was subsequently reduced to 33%. This percentage may still appear to be somewhat high, but it is a significant reduction in imperviousness than what would normally be seen in this type of development. This reduction in imperviousness along with the redundant water quality BMPs (treating the first 1 inch of runoff from the impervious areas), expanded stream buffers and quantity control for the 1-year storm, will afford the best opportunity to mitigate the potential impacts of this development.

As a separate initiative, DEP is also investigating other opportunities for improving existing stormwater management controls in the watershed through the Montgomery County Stormwater Management Capital Improvement Program (CIP). DEP has completed a study of the drainage area on the University of Maryland Shady Grove campus. This study investigated possible improvements to the existing SWM pond and stream valley upstream of the pond. These proposed improvements consist of combinations of wetland enhancements, reforestation, and bank stabilization. Results of the study are now being reviewed by DEP. DEP has also met with the property managers to seek their cooperation in implementing some of these improvements.

DEP has also been working cooperatively with the M-NCPPC and staff from the city of Rockville to evaluate stream conditions and erosion problem areas throughout the Watts Branch watershed including Piney Branch. Over the next three years DEP will be identifying other potential stormwater retrofit and stream restoration projects within Watts Branch that may include additional projects to help protect Piney Branch.

Table 11. Piney Branch SPA Development Projects (1995 to February 2001)

PROJECT NAME	SPA LOCATION	DEVELOPMENT SIZE, TYPE	STATUS
Avon Glen	Piney Branch - middle reach	39.6 acres, RE-1 28 lots and sewer pumping station	Subdivision approval predated SPA designation. Sediment control plan approved with monitoring requirements. Under construction.
Boverman Property	Piney Branch - Lower reach	13.8 acres, RE-1	Preliminary/Final water quality plans approved. Under construction.
Bruck Property	Piney Branch - Lower Reach	16 acres, RE-1	Preliminary / final water quality plans approved. Under construction.
Burton Glen	Piney Branch-Lower reach	3.3 acres, 3lots	Water quality inventory approved.

Table 11 Continued. Piney Branch SPA Development Projects (1995 to February 2001)

Cavanaugh Property	Piney Branch - middle reach	18.1 acres, RE-1 Cluster, 18 lots proposed	Final water quality plan approved. Under construction.
Charles Duvall Farm	Piney Branch	0.5 acres, R-200 1 lot	Exempt from SPA Water Quality Plan Requirements.
Glen Mill Knolls	Piney Branch-Lower reach	4.13 acres, RE-1, 1 lot	Water quality inventory approved.
Grupenfoff Residence	Piney Branch	2 acres, 1 lot	Exempt from SPA Water Quality Plan Requirements.
Horizon Hills	Piney Branch-Lower reach	4.0 acres, RE-2	Water quality inventory approved. Sediment control permit pending.
Hunting Hill Woods	Headwaters	1.6 acres, R-200, 3 lots	Water quality inventory approved. Sediment control permit pending.
Lakewood Glen	Piney Branch	5.2 acres, RE-1 5 lots proposed	Exempt from water quality plan requirements.
Lankler Property (Highgate)	Piney Branch-Lower reach	60.3 acres, RE-2	Water quality inventory approved. Under construction.
New Life Christian Fellowship Church	Piney Branch - Headwater area	1.2 acres, Proposed church	Pre-application meeting complete. On hold.
Otsuka America Pharmaceutical, Inc.	Piney Branch **B** Headwaters	4.7 acres, R&D	Preliminary / final water quality plans approved. Construction complete, as-built pending.
Peters Property	Piney Branch-Lower reach	RE-1, Cluster Option	Preliminary/Final water quality plans approved. Under construction.
Piney Glen Village	Piney Branch **B**Middle reach	188 acres, Mixed residential	Some of the project predates SPA requirements. Sediment control permits issued. Under construction.

Table 11 Continued. Piney Branch SPA Development Projects (1995 to February 2001)

Piney Meetinghouse Road and Travillah Road Improvements	Piney Branch-Middle reach	Road Improvements	Preliminary/final water quality plans approved. Sediment control permit pending.
Piney Meetinghouse Road Site - Fling Property	Piney Branch **B**Middle reach	6.4 acres, RE-2, proposed mulching/ landscape operation	Preliminary/final water quality plans approved. Pending special exception.
Potomac Glen South	Piney Branch	15.3 acres, RE-1 8 lots proposed	Exempt from water quality plan requirements due to low imperviousness. Construction complete.
Shady Grove Life Sciences Center - Life Technologies Inc.	Piney Branch **B** Headwaters	18.1 acres - R & D	Preliminary plan approved prior to SPA designation; however, voluntary compliance. Water quality plans approved. Initial construction complete.
Shady Grove Road	Piney Branch **B** Headwaters	8 acres, Road extension	Preliminary and final water quality plan approved. Construction is complete. Awaiting as-built approvals.
Snider Property	Piney Branch **B** Lower Reach	21.9 acres, RE-1C	Preliminary/final water quality plan approved. Sediment control permit issued. Under construction.
Temple Beth Ami	Piney Branch **B** Headwaters	7.9 acres, R-200 TDR Church	Preliminary and final water quality plans approved. Construction is complete. As-Built is pending.
Tenny Property	Piney Branch	2.5 acres, R-200 5 lots	Exempt from water quality plan requirements.

Table 11 Continued. Piney Branch SPA Development Projects (1995 to February 2001)

Traville (6 Site Plans) 1) Day Care Center 2) Affordable Housing 3) Retail Center 4) Village Center Streets 5) Avalon Bay 6) Human Genome Sciences	Piney Branch **B** Headwaters	192 acres, MXN and R&D (there are two additional R&D sites that will be developed in the future)	Preliminary water quality plan approved. Separate final water quality plans have been submitted for each of the 6 site plans. Human Genome Sciences, Village Center Streets and the Retail Center final water quality plans are nearing approval.
Willow Oaks	Piney Branch-Middle reach	5.5acres, R-200	Preliminary water quality plan approved.
Willows of Potomac	Piney Branch **B** Middle reach	245 acres, mixed residential	Subdivision approvals predate SPA requirements. Sediment control permits issued. Site under construction.
Wilson Property	Piney Branch-Lower reach	10.3 acres, RE-2	Pre-application meeting complete.

4.3.3 Summary of Environmental Protection and Innovative Site Design: The Revised Traville Concept for Consolidation of Human Genome Sciences

The Traville project at the headwaters of the Piney Branch continues to provide many challenges in the effort to achieve a successful combination of development and water quality/environmental protection. However, recent changes to the concept for the largest Research and Development (R&D) portion (with Human Genome Sciences as the principal tenant) reflects achievement of many environmental objectives of the Special Protection Area program.

In addition to standard SPA elements such as SWM features in series, and protection and enhancement of environmental buffers and the natural resources within them, the concept proposes use of many site design elements to reduce environmental impacts of the development on Piney Branch, within the framework of master planned land uses and zoning.

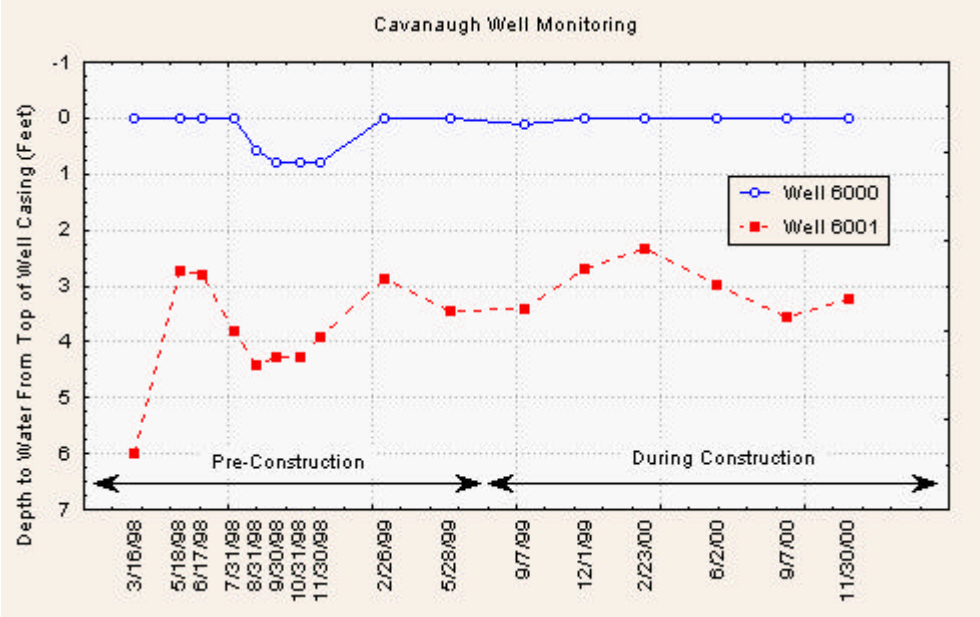
These elements include: use of taller buildings, internal garages, and structured parking leading to lower impervious cover; greater open space leading to enhanced opportunities for more gentle, natural appearing, aesthetic multi-use recharge/infiltration/ water quality treatment facilities (including two volleyball courts within a sand filter); flexibility in the location of the edge of grading resulting in better achievement of environmental and development objectives; and more

opportunity for appropriate transitions between natural and developed areas. Further design enhancements serving multiple objectives are still being considered. Hopefully the cumulative effect of these design features will result in a project that has minimal negative impacts on water quality in the SPA.

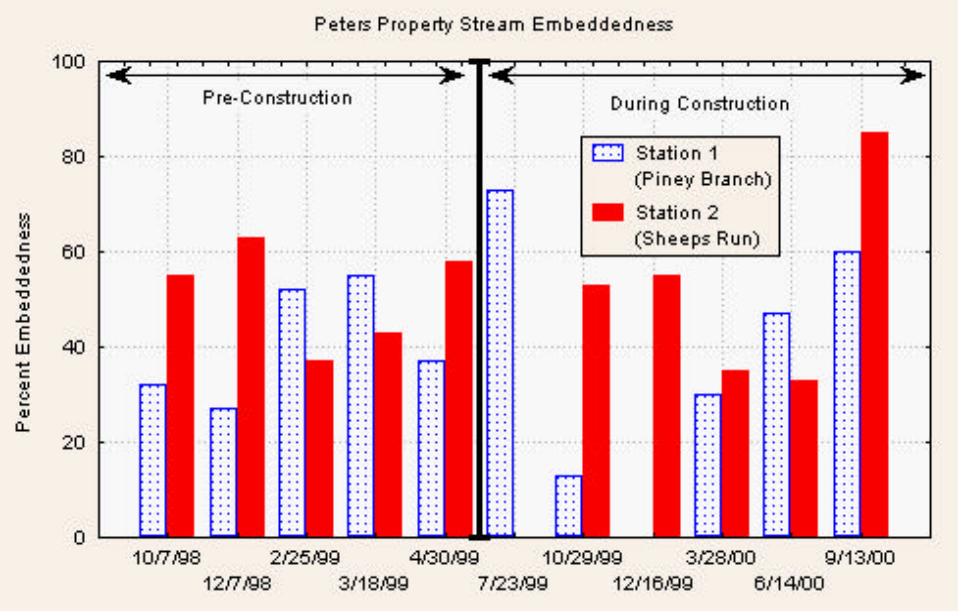
4.3.4 Summary of BMP Monitoring in Piney Branch

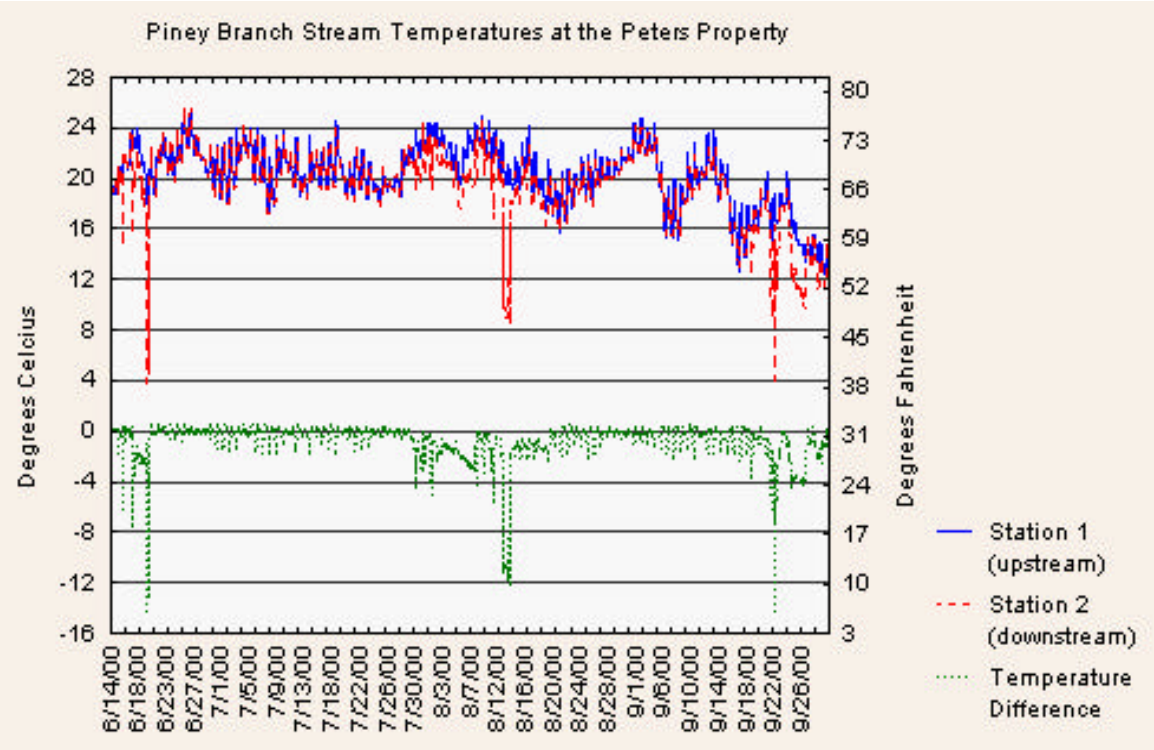
There are seven sites in Piney Branch SPA that have submitted BMP monitoring data. The Traville site has not yet started construction. Pre-construction monitoring of this site was done from 1997 through 1999. No data has been received from this site in the past year. The Life Sciences Center is completed but monitoring of the site began after construction so no comparisons with pre-construction data are possible. The five other sites in this SPA have started construction and have provided data on current conditions. Data from the Boverman and Bruck sites was received in February 2001 and will be analyzed as part of next years SPA annual report.

Data from the Cavanaugh project indicates that groundwater levels in well number 6001 exhibit seasonal variation but are not particularly different during construction than they were prior to the initiation of construction activities (Figure 46). Water levels in the well decreased during the drought of 1999 but a larger decrease was observed in the summer of 1998 prior to the start of construction. Well number 6000 is located in a wetland area adjacent to a small stream that flows through the site. It has generally had water flowing out from the top of the well during each field measurement. The only period when this well was not artesian was during the summer of 1998. As no actual water surface elevation can be measured from a well with these characteristics, it is not currently providing useful information on groundwater levels at the site.

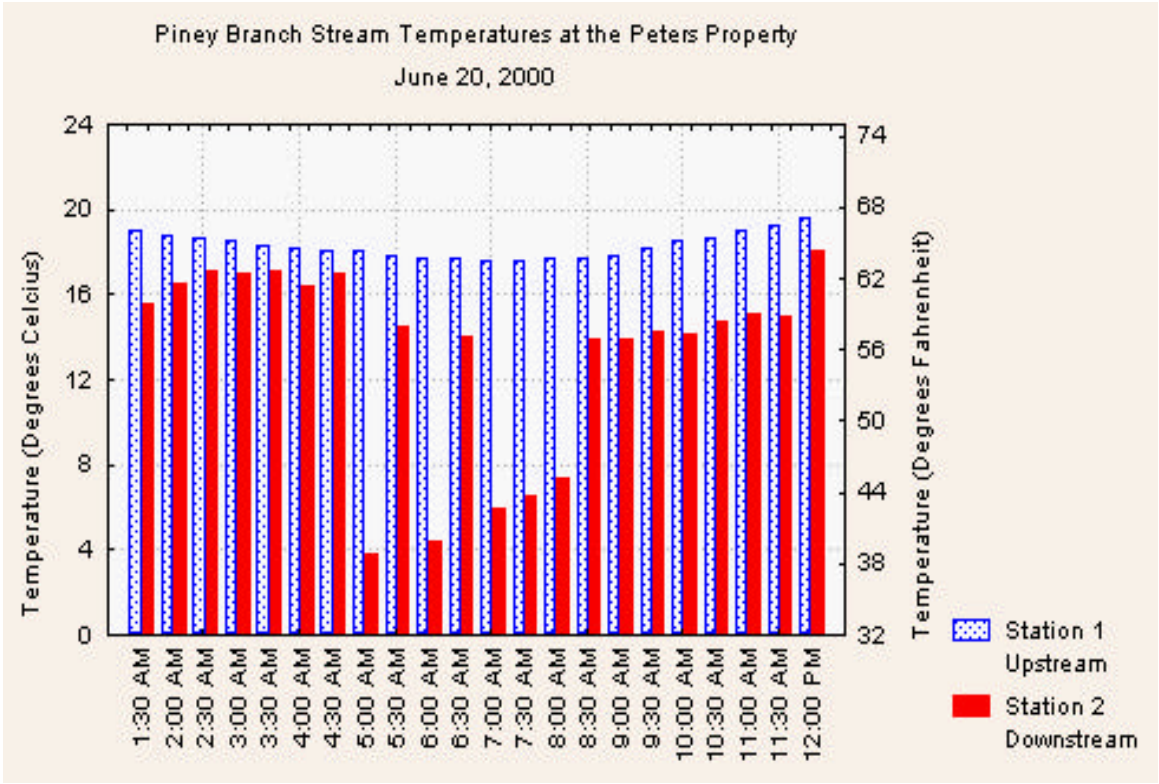


Embeddedness data from the Peters property indicates episodic increases in sedimentation since construction commenced (Figure 47). Embeddedness values obtained since construction commenced have generally been comparable to values observed prior to construction. However, in both streams, embeddedness has on occasion been higher than before construction. On July 23, 1999 embeddedness in Piney Branch was measured at 73%. The highest value observed during the pre-construction period was 55%. On September 13, 2000 embeddedness in Sheeps Run was measured at 85%. The maximum embeddedness value observed in Sheeps Run prior to construction was 63%.

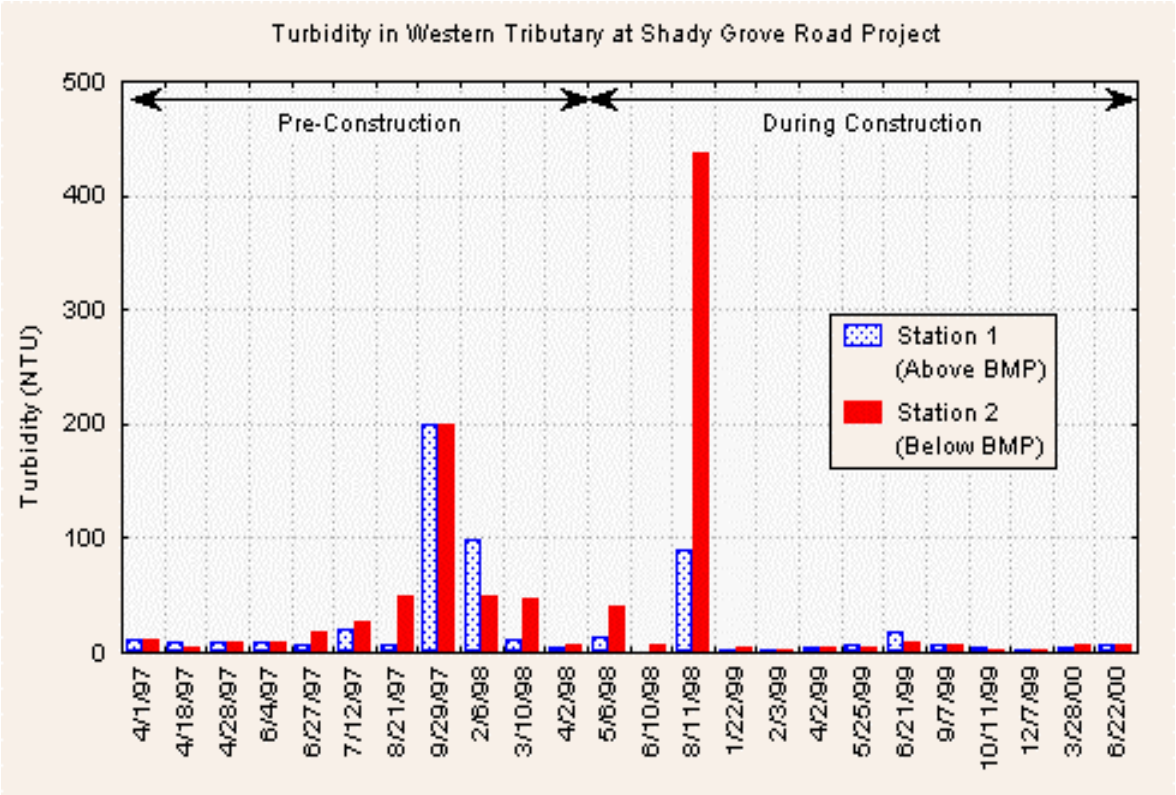


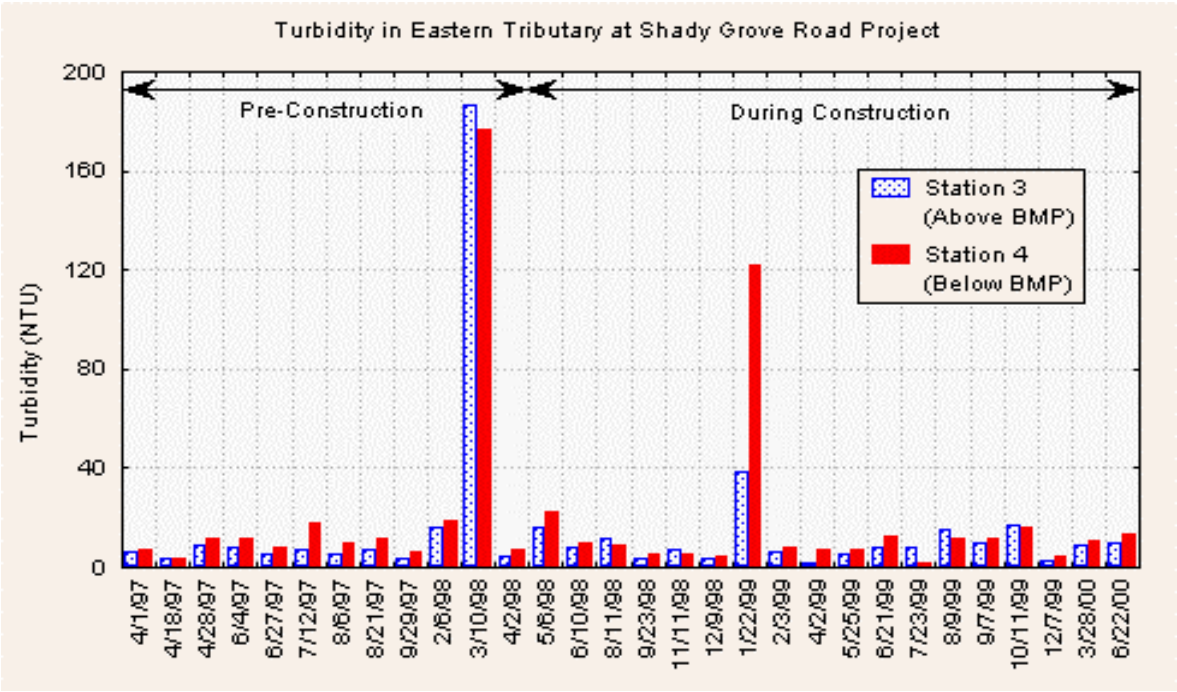


Temperature data collected by the developer=s consultant at this site in 2000 is suspect. Figures 48 and 49 are graphs of temperature data from the site. The data shows unlikely values and wide fluctuations at the downstream temperature logger. For example, on the morning of June 20, 2000 the upstream logger showed little change in stream temperature, averaging 64.9 °F (Figure 49). The downstream logger fluctuated rapidly between 62.60 °F and 38.82 °F. Over the summer the downstream logger indicated that stream temperatures were consistently lower there than at the upstream site. On average, the downstream readings were 1.37 °F degrees lower than upstream. A maximum difference of 25.62 °F was seen between the upstream and downstream loggers at the site. This pattern of fluctuating temperatures downstream that are generally quite a bit cooler than temperatures upstream indicates that the logger was not working properly. Evaluation of the temperature effects of the site cannot properly be done until further data has been received.


Piney Branch Stream Temperatures at the Peters Property
June 20, 2000
Temperature (Degrees Celcius)
Temperature (Degrees Fahrenheit)
0
4
8
12
16
20
24
32
38
44
50
56
62
68
74
1:30 AM
2:00 AM
2:30 AM
3:00 AM
3:30 AM
4:00 AM
4:30 AM
5:00 AM
5:30 AM
6:00 AM
6:30 AM
7:00 AM
7:30 AM
8:00 AM
8:30 AM
9:00 AM
9:30 AM
10:00 AM
10:30 AM
11:00 AM
11:30 AM
12:00 PM
Station 1
Upstream
Station 2
Downstream

At the Shady Grove Road project there are two sediment ponds that treat construction runoff at the site. The ponds outfall to two different streams. One pond treats water draining to the easternmost of the two streams. The other pond treats water going to the western stream. Shady Grove Road monitoring stations 1 and 2 are on the western stream. Station 1 is above the pond outfall and station 2 is below the pond outfall. Stations 3 and 4 are on the eastern stream. Station 3 is above the pond outfall and station 4 is below the outfall. In 2000, data on stream embeddedness and turbidity has been received from these stations for three dates between December 1999 and June 2000. The data indicates that turbidity has remained low in both streams and no increase in turbidity has been observed downstream of the site since early 1999 (Figures 50 and 51). Embeddedness values at the site also indicate that the project is not increasing the amount of sediment in the stream channel (Figures 52 and 53). Readings above and below the pond outfalls have been comparable on the three dates when measurements were taken. Measurements taken between October 1998 and October 1999 indicate that embeddedness was lower below the outfall on the western tributary than above the outfall. The three readings submitted since last year's report do not continue that trend. Table 12 below identifies BMP monitoring data currently being collected from projects in Piney Branch SPA.


Turbidity in Western Tributary at Shady Grove Road Project
Pre-Construction
During Construction
Turbidity (NTU)
500
400
300
200
100
0
Station 1
(Above BMP)
Station 2
(Below BMP)
4/1/97
4/18/97
4/28/97
6/4/97
6/27/97
7/12/97
8/21/97
9/29/97
2/6/98
3/10/98
4/2/98
5/6/98
6/10/98
8/11/98
1/22/99
2/3/99
4/2/99
5/25/99
6/21/99
9/7/99
10/11/99
12/7/99
3/28/00
6/22/00


Turbidity in Eastern Tributary at Shady Grove Road Project
Pre-Construction
During Construction
Station 3
(Above BMP)
Station 4
(Below BMP)
Turbidity (NTU)
200
160
120
80
40
0
4/1/97
4/18/97
4/28/97
6/4/97
6/27/97
7/12/97
8/6/97
8/21/97
9/29/97
2/6/98
3/10/98
4/2/98
5/6/98
6/10/98
8/11/98
9/23/98
11/11/98
12/9/98
1/22/99
2/3/99
4/2/99
5/25/99
6/21/99
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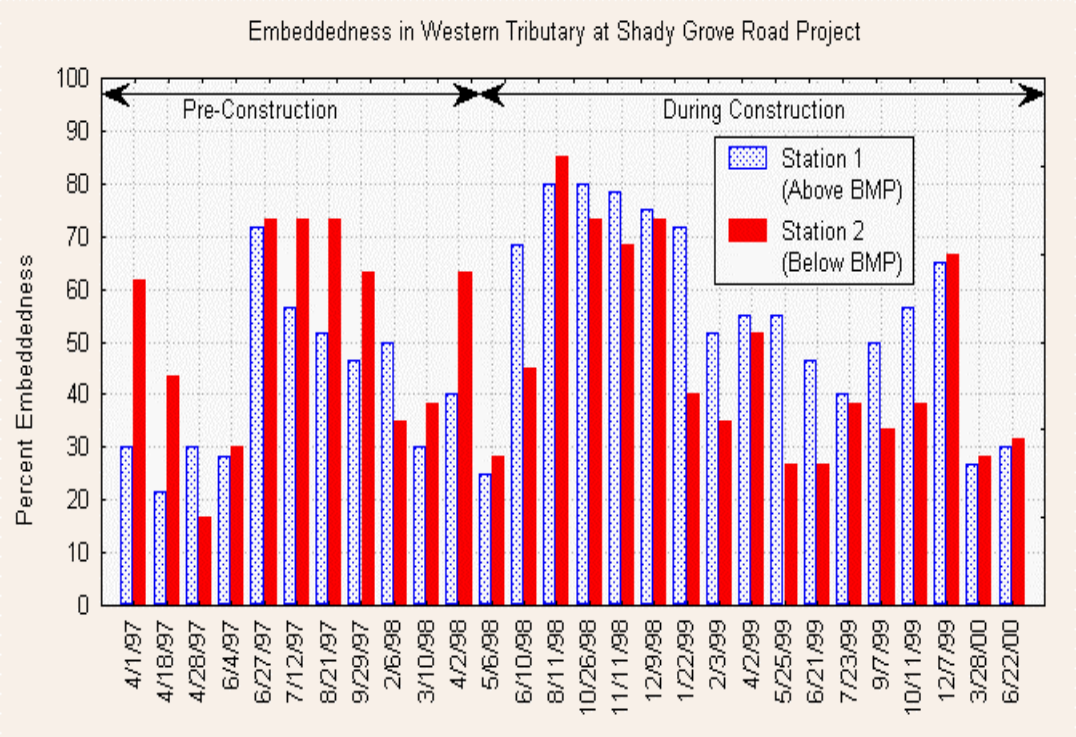
8/9/99
9/7/99
10/11/99
12/7/99
3/28/00
6/22/00


Embeddedness in Western Tributary at Shady Grove Road Project
Pre-Construction
During Construction
Station 1 (Above BMP)
Station 2 (Below BMP)
Percent Embeddedness
0
10
20
30
40
50
60
70
80
90
100
4/1/97
4/18/97
4/28/97
6/4/97
6/27/97
7/12/97
8/21/97
9/29/97
2/6/98
3/10/98
4/2/98
5/6/98
6/10/98
8/11/98
10/26/98
11/11/98
12/9/98
1/22/99
2/3/99
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10/11/99
12/7/99
3/28/00
6/22/00

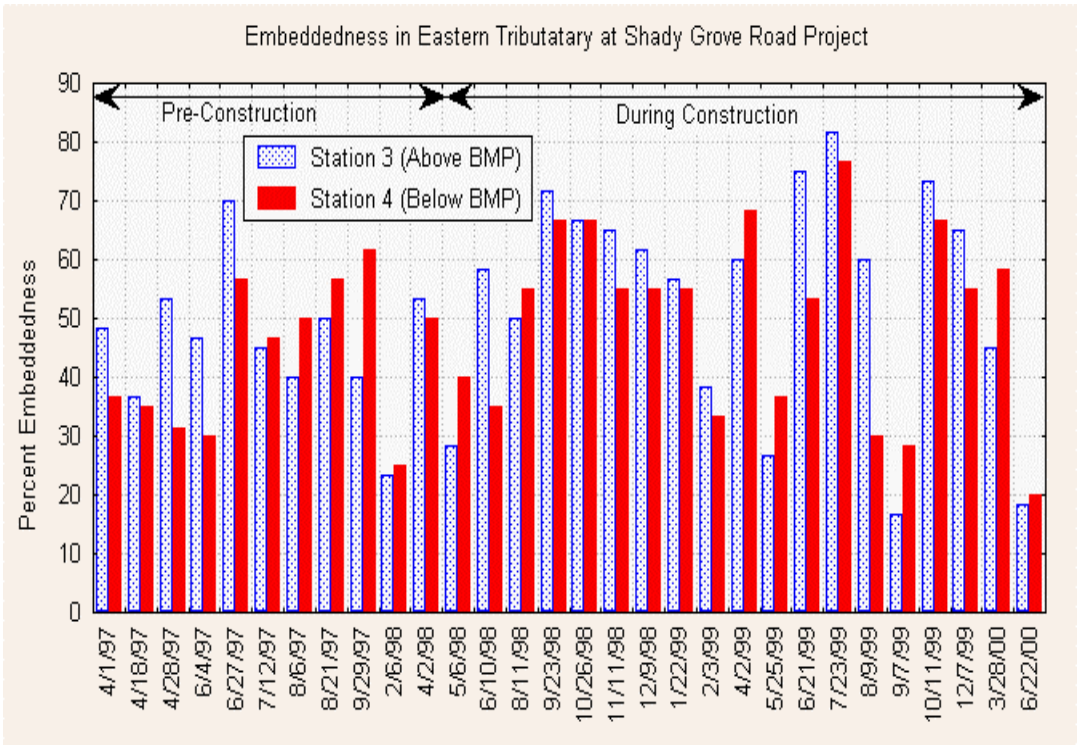

Embeddedness in Eastern Tributatary at Shady Grove Road Project
Pre-Construction
During Construction
Station 3 (Above BMP)
Station 4 (Below BMP)
Percent Embeddedness
0
10
20
30
40
50
60
70
80
90
4/1/97
4/18/97
4/28/97
6/4/97
6/27/97
7/12/97
8/6/97
8/21/97
9/29/97
2/6/98
4/2/98
5/6/98
6/10/98
8/11/98
9/23/98
10/26/98
11/11/98
12/9/98
1/22/99
2/3/99
4/2/99
5/25/99
6/21/99
7/23/99
8/9/99
9/7/99
10/11/99
12/7/99
3/28/00
6/22/00

Table 12. Piney Branch BMP Monitoring

PROJECT NAME & CONSULTANT CONDUCTING THE MONITORING	REQUIRED BMP MONITORING	REQUIRED TIME FRAME FOR BMP MONITORING	DATA SUBMITTED THUS FAR
Shady Grove Road / Loiderman Assoc. ***(construction phase began 2/98)***	**4 turbidity stations** **4 embeddedness stations**	**pre-development monitoring:** 1 year **during-development monitoring:** until site is stabilized and sediment control structures converted to water quality **post-development monitoring:** min. 3 years	**turbidity data:** 4/97 - 6/00 **embeddedness data:** 4/97 - 6/00
Traville / Loiderman Assoc. ***(Pre-construction monitoring complete. Construction has not started as of 11/99)***	**2 continuous temperature loggers** **groundwater monitoring wells** *water level* **1 continuous flow logger**	**pre-development monitoring:** 1 year **during-development monitoring:** until site is stabilized and sediment control structures converted to water quality **post-development monitoring:** to be determined at final site plan approval.	**temperature data:** 6/97 - 9/97 6/98 - 9/98 6/99 - 9/99 **groundwater data:** 8/97 - 10/97 **flow data:** 8/97 - 10/97
Life Sciences Center / Schnabel Engineering *(Construction complete)*	**3 groundwater monitoring wells** *Water Level, Conductivity, pH*	total of 5 years beginning October 1997	**groundwater data:** 10/97 - 1/98
Bruck Property ***(construction phase began ~ 8/99)***	**2 continuous temperature loggers** **1 embeddedness station**	**pre-development monitoring:** 1 year **during-construction monitoring:** until site is stabilized and sediment control structures converted to water quality **post-construction monitoring:** 3 years	**temperature data:** 7/98 - 9/00 **embeddedness data:** 6/30/99, 12/19/99, 5/5/00, 9/28/00
Boverman Property (construction phase began 7/99)	**1 continuous temperature logger** **1 embeddedness station** **1 groundwater well:** *nitrate, nitrite, TKN,, total Phosphorus*	**pre-development monitoring:** 1 year **during construction monitoring:** until site is stabilized and sediment control structures converted to water quality **post construction monitoring:** 3 years	**temperature data:** 7/98 - 9/00 **embeddedness data:** 6/30/99, 12/19/00, 5/5/00, 9/28/00 **groundwater well data:** 6/30/99, 11/3/99, 1/9/00, 9/28/00

Table 12 Continued. Piney Branch BMP Monitoring

Cavanaugh Property ***(construction phase began 6/99)***	**3 continuous temperature loggers** **2 groundwater wells** **1 embeddedness station**	**pre-development monitoring:** 1 year **during construction monitoring:** until site is stabilized and sediment control structures converted to water quality **post construction monitoring:** 2 years	**temperature data:** 7/98 - 9/98, 5/99-10/99 **groundwater data:** 3/98 - 2/01 **embeddedness data:** 8/98 - 6/00
Peters Property (Construction phase began 6/99)	**2 continuous temperature loggers** **2 embeddedness stations** **1 continuous flow logger** **photo documentation of pond outfall condition**	**pre-development monitoring:** 1 year **during construction monitoring:** until site is stabilized and sediment control structures converted to water quality **post construction monitoring:** 2 years for photo documentation and 3 years for all other monitoring	**temperature data:** 4/99 - 10/99, 6/00-10/00 **embeddedness data:** 10/98 - 9/00 **flow data:** 2/00-12/00 **photo documentation:** 10/98-6/00

4.3.4.a Willows of Potomac Monitoring Results - Case Study Follow-up

Last years SPA annual report included a section in which monitoring results from the Willows of Potomac development in the Piney Branch SPA were discussed. In summary, this section stated that stream conditions declined abruptly in 1996. The cause of this decline was a combination of flooding and sediment input from the Willows of Potomac which was under construction in 1996. Subsequent stream monitoring in 1997 and 1998 showed a full recovery in terms of the benthic macroinvertebrate community and in-stream sedimentation. This led us to conclude in last years report that the impairment documented in 1996 was a short term impact. However, more recent monitoring results suggest otherwise.

Monitoring results from 1999 and 2000 have shown a large decline in the benthic macroinvertebrate community along the entire Piney Branch mainstem from the Willows of Potomac development downstream to Glen Mill Road. No other monitoring parameters (ie. habitat, water temperature, pH, Dissolved Oxygen, etc.) have declined which makes it difficult to explain. The fish community has remained intact and is as healthy now as it was in 1995 (prior to construction of the Willows of Potomac development).

Much of the Willows of Potomac development was built out by 1999 and the sediment control ponds have been converted to water quality/quantity wet ponds. However, even with the functioning water quality/quantity ponds in place there appear to be impacts coming from this

development that are effecting the benthic macroinvertebrates specifically and causing a shift to a more pollution tolerant community. There are many possibilities as to the cause of this impact including increased water temperature from the wet ponds (although temperature data from consultant studies do not indicate an increase), water quality impairment from excessive fertilizer and pesticide use on the newly landscaped development and residual in-stream sediment from construction activities. DEP plans to investigate these potential problems during 2001 and will report the findings in next years annual report.

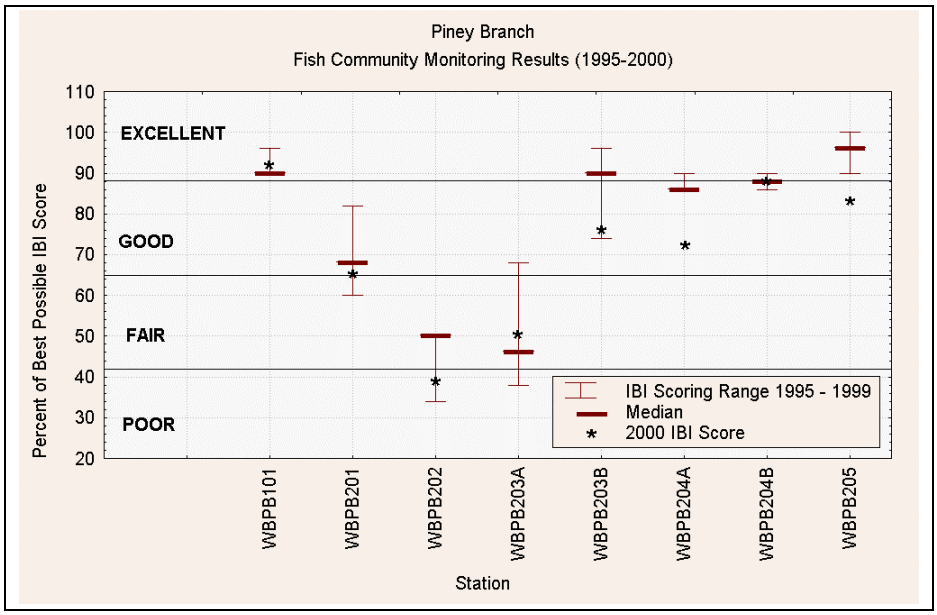
4.3.5 Summary of Stream Monitoring in Piney Branch

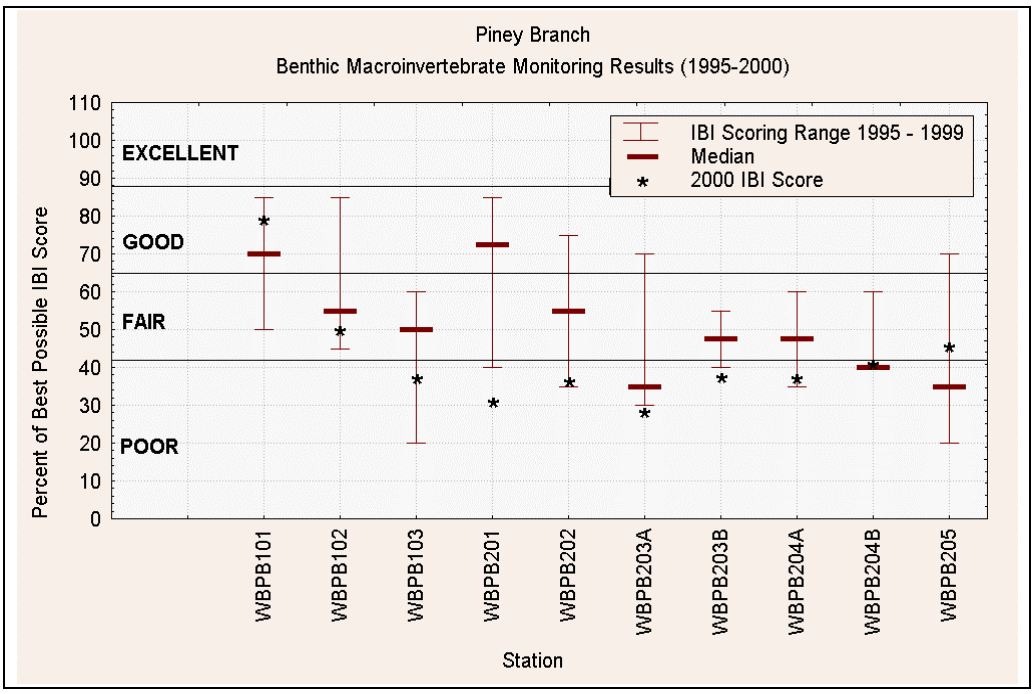
Baseline stream monitoring began in the spring of 1995 at six stations along Piney Branch. Four stations were added in 1997 to provide data immediately downstream of develop sites. Benthic macroinvertebrates were sampled at all ten stations in 2000 and fish were sampled from eight stations. Quantitative stream habitat surveys were completed at three stations.

4.3.5.a Biological Monitoring

Results of biological monitoring in Piney Branch during 2000 are presented in Figures 54 and 55 along with results from previous years. As can be seen in Figure 54, results of fish monitoring in 2000 indicate little or no change in the fish community. Trends identified in prior years continue to exist. For example, stations located in the upper headwater areas of Piney Branch (PB201, PB202, PB203A) support fish communities of lower quality then those stations located in the middle and lower portions of the watershed. This is due, in part, to smaller stream size and less available fish habitat in the upper portions of the watershed.

During the summer of 1999 the region experienced drought conditions which reduced stream flows to a trickle or in some cases dried up streams completely. Stream flows persisted in Piney Branch from station WBPB201 (Figure 44) downstream to the confluence with Watts Branch, although at much lower rates then normal. Lower stream flows during the summer of 1999 did have an effect on the fish community. For example, overall numbers of fish collected during 2000 sampling were lower then previous years at all stations. However, diversity in the fish community remained intact. IBI scores from 2000 were similar to previous years (Figure 54).




Piney Branch
Benthic Macroinvertebrate Monitoring Results (1995-2000)
IBI Scoring Range 1995 - 1999
Median
2000 IBI Score
EXCELLENT
GOOD
FAIR
POOR
Percent of Best Possible IBI Score
110
100
90
80
70
60
50
40
30
20
10
0
WBPB101
WBPB102
WBPB103
WBPB201
WBPB202
WBPB203A
WBPB203B
WBPB204A
WBPB204B
WBPB205
Station

Results of benthic macroinvertebrate monitoring from 2000 are presented in Figure 55. As can be seen in the graph, benthic macroinvertebrates continue, for a second year, to indicate that a shift to a more pollution tolerant community has occurred throughout the mainstem of Piney Branch. Results from the Western Tributary (WBPB101) indicate no such shift has occured there. The Western Tributary is subject to essentially the same weather and hydrological conditions as the rest of the watershed. However, no development has occurred in this sub-watershed. The continued presence of high quality biological communities in the Western Tributary tends to rule out natural stressors (ie. drought or flooding) as the major cause of impairment throughout the rest of Piney Branch Watershed.

Last years SPA Annual Report discussed several hypotheses that could explain the cause of the decline in the benthic macroinvertebrate community. One hypothesis was that large amounts of algae present in the stream during the spring 1999 sampling season may have reduced sampling efficiency by clogging the nets. This condition was not observed in spring of 2000 and therefore is not likely to be the cause of impairment.

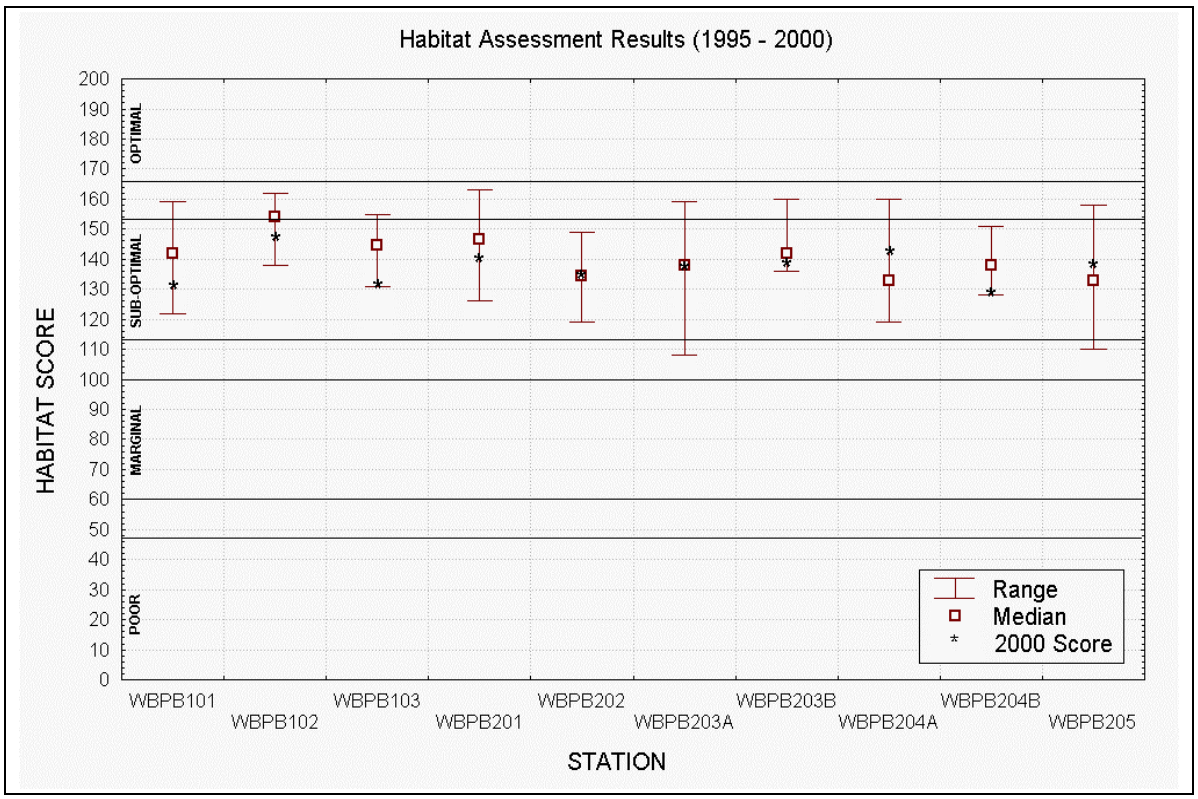
Remaining possible causes for impairment are increased water temperatures, toxic substances, hydrological changes caused by development, sediment or a combination of these factors. Several large wetponds were installed at the Willows and Piney Glenn Village developments. Monitoring results from these two developments indicate some thermal impact does exist. If, following a cool wet year as 2000 was, the benthic macroinvertebrate community shows signs of recovery, then it is likely that water temperatures are a significant factor in the recent declines in Piney Branch. However, if results from 2001 do not show recovery then other factors must be examined. In the coming year DEP plans to look more closely at our biological data from this SPA. We will study the temperature effects of selected sites in the SPA and may conduct additional water and sediment sampling to develop a better understanding of chemical factors.

4.3.5.b Habitat Monitoring

Results of all habitat assessments done in Piney Branch are presented in Figure 56. Habitat scores from all stations have remained in the sub-optimal range. This means that overall habitat conditions in the stream are adequate to support a diverse biological community.

Figure 56. Summary of All Piney Branch Habitat Assessments (asterisk represents the average of two assessments done in 2000)

Review of individual parameters that make up the habitat assessment has revealed problems with certain aspects of the stream habitat. For example, in 1996 those parameters that assess stream sedimentation scored very low (indicating high levels of in-stream sediment) at stations



WBPB202 and WBPB203A (1999 SPA annual report). In 1997 and 1998 stream sediment scores increased and in 2000 further improvement was documented in terms of the amount of sediment observed in the riffle areas at these two stations.

Results of habitat assessments from 2000 indicate some increased sedimentation at stations WBPB102 and WBPB103. Both of these stations are located in the headwaters of Piney Branch just downstream of new Shady Grove Rd.

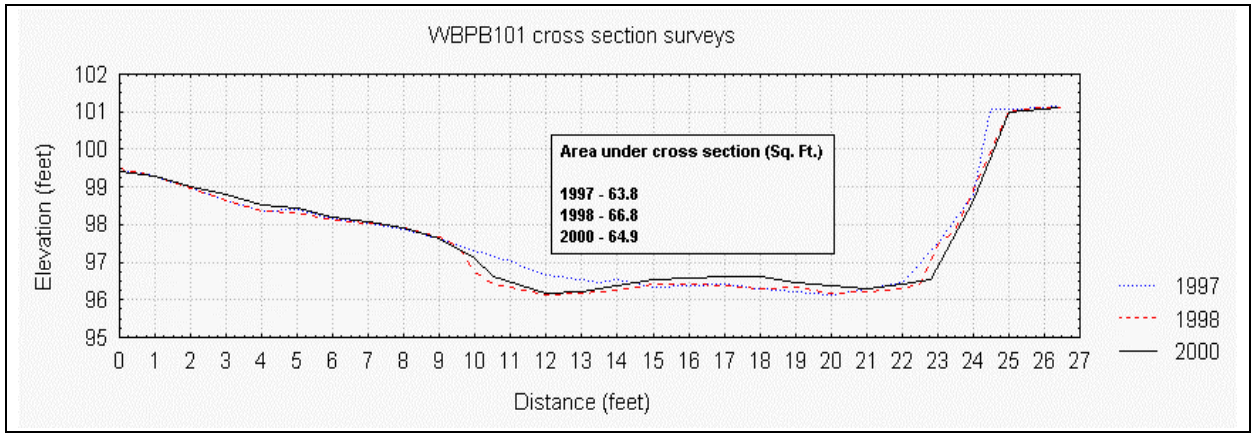
Stream Channel Morphology Assessment

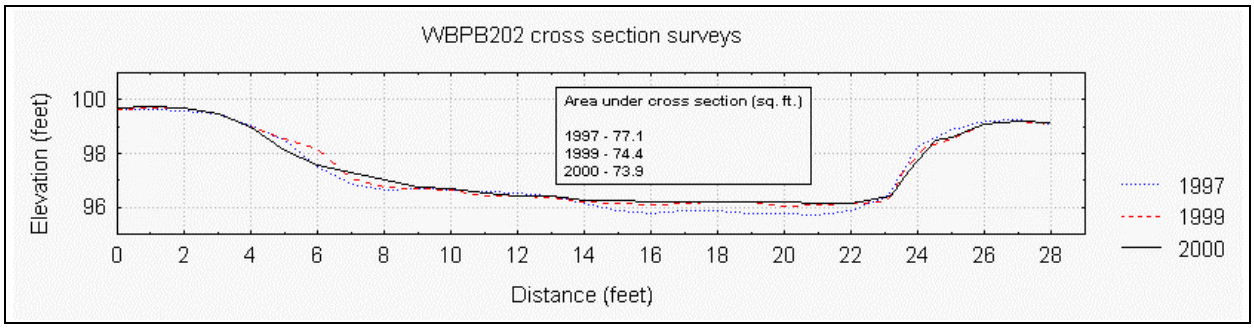
Quantitative habitat assessments were completed at three stations in Piney Branch during 2000.

One component of this monitoring involves surveying the stream channel cross section over time to determine if channel enlargement is occurring in response to new development in the watershed. Results of this monitoring indicate little change in stream channel dimensions throughout Piney Branch (Figures 57 and 58).

Figure 57. Cross Section of Stream Channel at Station WBPB101

Figure 58. Cross Section of Stream Channel at Station WBPB202





5.0 Evaluation and Recommendations

Monitoring results continue to produce a broader range of trend data that will help assess how effective careful water quality review, performance goal setting, improved site planning and intensive BMP controls are in mitigating development impacts in SPA=s. Although the current program seems to be working well overall, data from some SPA monitoring sites have shown temperature and sedimentation impacts accompanying new development projects. While the sediment pulses may be transitory and short term, the temperature impacts may not be. Effectiveness in mitigating impacts cannot be fully judged until more development projects have been completed and their long term effects on streams evaluated. Currently, the program is continuing to generate a comprehensive set of information on baseline conditions in the SPA=s. Good information is also being generated on the effects of construction and the efficacy of BMP=s produced under SPA guidelines. In the meantime, practices and procedures continue to be refined and improved in order to enhance the overall effectiveness of the program.

Some refinement of the SPA regulations (Executive Regulation 29-95, "Water Quality Review for Development in Designated Special Protection Areas") may also be in order. We have identified an aspect of the regulations that may have unintended and undesirable effects with regard to BMP monitoring data. That is the requirement that all development sites which need to submit a water quality plan must do some sort of BMP monitoring. This has been very difficult to administer in an equitable manner due to great differences in both the nature of new development projects and in the site designs. Some projects, because of the way the are laid out, are better suited to monitor BMP performance and as a result may have more monitoring requirements. In addition, BMP monitoring requirements have resulted in many relatively small projects doing some limited monitoring which may not be adequate to fully understand how BMP=s are functioning and whether or not performance goals are met. Finally, the ability of a limited SPA staff to track and analyze BMP monitoring data submitted from the rapidly growing number of projects will soon be maxed out. For these reasons it is felt that modification of SPA regulations, in regard to BMP monitoring requirements, may be needed to improve this situation. We will in the coming year investigate whether the regulations should be modified to improve the quality of results coming out of the SPA program.

It is anticipated that information will be forthcoming that allows pre-construction data to be compared with data collected after the completion of construction. This will give a better idea of the ability of BMP=s, integrated into an innovative site plan, to minimize the impacts of development in the long term. It will allow a better evaluation of the ability of the SPA program to mitigate the effects of planned development while still maintaining water quality. This data will be essential in evaluating the effectiveness of the SPA program as a whole and allow future activities to be targeted in the most effective way possible.

Some portions of SPA=s are also targeted for stream restoration. This restoration is intended to improve stream habitat in areas already degraded by development which occurred before the SPA program came into effect. Older developments frequently lack adequate stormwater controls, as requirements prior to the SPA program were not as stringent as current requirements in the

SPA's. This restoration work is funded under the Department of Environmental Protections Capital Improvement Program (CIP), or through direct mitigation efforts by developers. Section 4.2.5.c of this report mentions some projects undertaken to alleviate temperature problems in the Paint Branch SPA. In other areas deforestation and bank stability problems are being addressed through restoration efforts. These programs have produced a number of very beneficial projects throughout the County and further utilization of restoration techniques could have a great impact in some areas of the SPA's. Monitoring in the coming year will continue to evaluate the effects of these projects on the streams.

Several areas have been identified where encroachment on parklands is adversely affecting streams. DEP will attempt to improve this situation by working with the M-NCPPC to promote increased enforcement of public property rights and investigate the need for potential restoration projects in these areas.

Some rural / agricultural properties have been identified that would be excellent candidates for inclusion in the Maryland Conservation Reserve Enhancement Program (CREP). DEP will work with the Montgomery Soil Conservation District to provide information and discuss the CREP program and its benefits with land owners.

The 1999 drought was a very rare event. Monitoring in 2000 showed that the streams were adversely affected by the drought. Future monitoring will be assessed to see how quickly the streams recover.

The decline in the benthic macroinvertebrate community at many stations in Piney Branch is troubling and will be further investigated this year. DEP also plans to investigate streams at the Detention Center site in Clarksburg SPA to determine if elevated levels of nutrients (nitrates) observed in groundwater wells are getting into the stream.

DEP also continues to refine its stream monitoring program. The approved fiscal year 2001 budget supported the installation of three stream gages to assess changes in stream baseflow and stormflow conditions related to changes in watershed development. We will be installing these gages in each of the three SPA's this year.

Appendix 1: Explanation of the Special Protection Area Program

App. 1.1 Purpose of Special Protection Areas

Article V of the Montgomery County Code defines Special Protection Areas (SPA's) as geographic areas which may be designated by the County Council where: "...1) existing water resources or other environmental features directly relating to those water resources are of high quality or unusually sensitive; and 2) proposed land uses would threaten the quality or preservation of those resources or features in the absence of special water quality protection measures which are closely coordinated with appropriate land use controls....@

SPA program purposes specified in Article V are to:

> *1) establish coordinated procedures, performance goals, criteria, and requirements for development in SPA's that will mitigate adverse impacts on water resources during and after construction or other land disturbing activities; and,*
>
> *2) provide a focused, coordinated approach for water quality protection and monitoring in SPA's.*

App. 1.2 Designated Special Protection Areas

To date, the County Council has designated three areas within the County as high quality stream systems which are in need of measures beyond current standards to assure that they are protected to the greatest extent possible from the impact of master planned development activities (Figure 1). In chronological order of their designation these SPA's are: the Clarksburg Master Plan SPA; the Upper Paint Branch Watershed SPA; and the Piney Branch Watershed SPA. Once Special Protection Areas are designated all subsequently approved plans for development, except for those with a valid record plat recorded prior to October 31, 1994, are required to comply with Executive Regulation 29-95, Water Quality Review for Development in Designated Special Protection Areas.

App. 1.3 Water Quality Plan Review Process

The SPA program requires the Montgomery County agencies and M-NCPPC to work closely with project developers to pro-actively address possible impacts to the existing stream conditions and to guide the development of related concept plans for site layout, environmental buffers, forest conservation, site imperviousness, stormwater management, and sediment control earlier in the regulatory review process. Outside of SPA=s, County and M-NCPPC staffs generally are able to review a project only *after* a plan is formally submitted by an applicant showing a proposed site's conceptual layout and stormwater management designs. This review typically occurs for the preliminary plan of subdivision. (Review of a proposed project=s conformance to environmental protection requirements and guidelines may also occur with a site plan, special exception application, mandatory referral, or zoning application). This sequencing of plan review requires a reactive response by County and M-NCPPC staffs to approve projects in the development review process. This often necessitates major modifications to development plans when County staff or

M-NCPPC staff find that environmental protection measures proposed by the applicant are inadequate.

Within SPA=s, County and M-NCPPC staffs are now able to convey environmental protection goals, objectives, and concerns to the applicant of a proposed development project *before* the applicant designs the initial site layout concept for the project. The SPA program is designed to put the environmental issues up front in planning for land development within the SPA's. This proactive approach reduces the potential for negative environmental impacts by requiring the County and the M-NCPPC to provide detailed environmental information and guidance on enhanced protection measures to the applicant prior to the concept plan design stage and before the formal development review process begins. Applicants are then able to design projects which take into account current available information on stream conditions, forest conditions, types of soils, site topography, and other environmental features, to address identified environmental constraints, and to incorporate enhanced BMP=s before concept plans are submitted.

Under the SPA program, most applications for new development projects in SPA=s are required to submit water quality plans which will provide a more comprehensive package of information to the County than is required as part of the more typical (i.e., non-SPA) development review process.

In addition to evaluating the stream conditions, the SPA review process includes site visits, analysis of subwatershed environmental characteristics, investigation of existing environmental problems, avoidance and/or minimization of the long term impacts of the development, and implementation of BMP monitoring plans.

App. 1.4 Public Input

A water quality plan is a document submitted by a permit applicant that demonstrates how a new development project within a SPA proposes to meet certain site-specific, watershed protection goals. It is required for most development projects within SPA=s. Typically, permit applicants must prepare both a preliminary and a final water quality plan.

After submission of a preliminary water quality plan, a SPA public information meeting will be held if requested in accordance with Executive Regulation 29-95. At these meetings developers present technical and site design information and methods to the public which show how the water quality plan will meet the performance goals for the SPA as specified in the SPA Conservation Plan. These meetings produce useful dialogue between the public, the County, M-NCPPC, and project developers regarding site design, environmental sensitivity, and BMP selection.

After considering input obtained at an informal public information meeting, the DPS, in coordination with DEP, acts on those aspects of the water quality plan in which the two agencies have lead agency responsibility (see Appendix 1.5 below for summary of lead agency responsibility in water quality plan review).

In addition, the Planning Board holds a public hearing for a water quality plan. as either part of, or in conjunction with a public hearing for the proposed development project itself. The Planning Board is required to review and act on those aspects of the water quality plan in which the M-NCPPC has lead agency responsibility (see also Appendix 1.5 below).

App. 1.5 Agency Review and Approval of Water Quality Plans

The SPA law requires that water quality plans for a project be approved by DPS, in coordination with DEP, and the Planning Board before the project can proceed. Each agency has lead role responsibility for different components of a water quality plan. M-NCPPC has lead agency responsibility for site imperviousness requirements and guidelines, environmental buffers, and forest conservation. Lead agency responsibility for DPS, in conjunction with DEP, covers stormwater management controls, sediment and erosion controls, and performance monitoring for best management practices. DEP has lead agency responsibility for carrying out and reporting the results from the SPA stream monitoring program, and for preparing SPA conservation plans.

App. 1.6 Glossary of Terms

BMP - Acronym for ›Best Management Practice:, refers to either a structure or practice that is designed to either improve water quality or reduce the impact that storm water runoff imparts on the receiving stream. Examples include but are not limited to: 1) storm water retention ponds - purpose is to collect, hold and release storm water runoff at a reduced rate, 2) bioretention areas - an area of densely planted wetland plants that act to uptake nutrients from stormwater runoff, 3) infiltration trench - purpose is to get as much storm water runoff into the ground as possible thus reducing the volume of runoff and recharging groundwater which is important in maintaining baseflow in a nearby stream.

IBI - Acronym for ›Index of Biological Integrity: - the IBI is simply a method of comparing the biological community found in any stream to that found in reference streams. Reference streams are the Aleast impaired@ streams within the Montgomery County region. By measuring how closely a stream compares to the reference condition, a relative assessment can be made of resource condition. The IBI rates the resource condition as excellent, good, fair, or poor. An excellent rating is equivalent or comparable to the reference condition, while a poor rating indicates a condition having little or no similarity to the reference condition. DEP has developed an interim IBI for both fish and benthic macroinvertebrates that is specific to the Montgomery County region.

Benthic Macroinvertebrates - Small creatures that spend at least part of their lives in or on the stream bottom. The name ›benthic macroinvertebrate: derives from the fact that they are bottom dwelling (benthic), large enough to see with the naked eye (macro), and without backbones (invertebrates). Benthic macroinvertebrates include not only insects but also crustaceans (crayfish), oligochaetes (worms) and mollusks (freshwater clams, snails).

Embeddedness - Refers to the extent to which rocks (gravel, cobble or boulders) are covered or sunken into the silt, sand or mud on the stream bottom. This is an important assessment in that many stream inhabitants occupy the spaces in between the rocks on the stream bottom. Thus, as embeddedness increases there are fewer spaces in between the rocks as this space is filled with sediment and therefore fewer stream inhabitants.

Riffle - That portion of a stream where water flows fast and shallow over rocky substrate. This area of a stream is where a majority of the benthic macroinvertebrates live along with several species of fish.

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