Major Environmental Planning/Resources Management Issues

This section describes the current conditions of each natural resource, highlights issues to be dealt with in the master planning process, describes ongoing actions and policies that apply to that resource and describes the results of analysis done as part of the master planning process.

Water Quality

The health of streams and wetlands has been of primary environmental concern for the state of Maryland for at least the past 30 years (see Watershed Management, page 18). The conditions of the Chesapeake Bay and its many tributaries have dramatically benefitted from the actions of environmental programs that reduce both point and some non-point sources of pollution. Clean-up of sewage plant discharges, removal of obstacles to fish passage, construction of stormwater management and stream enhancement projects have all improved the water quality. At the same time, continuing population growth and the resulting development threatens to outstrip the progress that has been made. Efforts in Montgomery County are coordinated with federal, state and regional programs to reduce the impact of new development and repair the impact of past activity.

The Washington region has seen evidence of the effects of extensive development in its watersheds, particularly further downstream in the Anacostia River system where conditions are unfavorable to many aquatic species.[2] Development impacts include streams overflowing their banks more frequently and to a greater magnitude; increased stream velocity and consequent scouring, channel widening, and loss of the pools and riffles which provide habitat diversity; more sedimentation smothering aquatic insects in the streambed; increased levels of pollutants; higher water temperatures and loss of wetlands. Habitat loss, shifts in food webs or nutrient flows and direct mortality which follow result in lower species abundance and diversity.[3]

[2] Metropolitan Washington Council of Governments, 1990 State of the Anacostia: 1989 Status Report.

[3] Specific impacts in the Anacostia basin as a whole include: 1) loss of 70% of its non-tidal wetlands; 2) loss of 75% of the watershed's forest cover; 3) channelization of more than 25 miles of streams and estuary, resulting in the loss of aquatic habitat and stream bank erosion; and 4) loss of fish and macroinvertebrate species(Metropolitan Washington Council of Governments, 1990).

For the most part, effects will be felt in stream ecosystems long before they are experienced by human communities. It is therefore imperative that potentially haffnful factors are monitored, corrected or prevented while a feasible response is still possible, in order to ensure our health, protect our recreational areas fr4orm degradation and properly fulfill the role of stewards of the natural resources, both locally and regionally.

This report includes the findings of a recent MNCPPC planning-level study of imperviousness and stream system quality within the watersheds of eastern Montgomery County. The analysis assessed the current health of the streams, documented the degree to which existing land uses have impacted streams using, watershed imperviousness as a measure, and proved how buildout of land uses according to the 1981 Master Plan may affect stream health.

The methodology and technical approach for analyzing watersheds in eastern Montgomery County are presented in the Appendix. Eastern Montgomery County was divided into sub-watersheds of relatively homogeneous land uses, and limited stream monitoring was conducted in the 1993 summer season using the US EPA Rapid Bioassessment Protocol II. This monitoring, combined with monitoring results from various local and state agencies, aided in characterizing existing stream quality conditions. GIS data was used to calculate impervious cover by sub-watershed and project imperviousness for the ultimate land use pattern in the 1981 Eastern Montgomery County Master Plan. The acreages of impervious features on the M&NCPPC GIS data layers (roads, parking lots, rooftops, play areas, etc.) were compiled, and detailed calculations were made to add in the many sidewalks and

Watershed Management: Historical Account of Government Action

The priority placed on water quality and watershed protection is a long-established priority in the County. These are some of the policies for part or all of eastern Montgomery County that have dealt with environmental issues:

- 1974 - Paint Branch and all its tributaries upstream of the Capital Beltway were officially designated "Use III," or Natural Trout Waters (i.e., able to support the propagation and survival of natural trout populations and their associated food organisms), by the state of Maryland.
- The Maryland Scenic and Wild Rivers Act (amended 1978) which designated the Anacostia and Patuxent as "Scenic Rivers."
- 1980 - DNR, in cooperation with Trout Unlimited, designated the Paint Branch watershed upstream of Fairland Road as a "Special Trout Management Area." These regulations aimed at maximizing protection while maintaining recreational fishing.
- The 1980 Patuxent River Watershed Act, which directed the Department of State Planning to prepare the Patuxent River Policy Plan. This plan was a land management strategy, approved by the seven counties within the Patuxent watershed.
- 1981 Eastern Montgomery County Master Plan — Major emphasis on watershed protection. Watershed management, the brown trout fishery and water supply and distribution systems are the subjects of the first three of seven "major environmental issues" identified. The plan includes provisions to protect headwaters, especially sensitive spawning tributaries from development by down-zoning, stream valley park acquisition and imperviousness limits.
- 1984 - The Anacostia Watershed Restoration Agreement signed by Maryland and the District of Columbia. In 1987, Montgomery and Prince George's Counties joined in the effort to form the Anacostia River Watershed Restoration Committee (AWRC) under a new agreement to protect and restore the water quality, ecological integrity, wetlands, and forest cover of the Anacostia River system. An action plan developed by the AWRC to achieve those objectives by the turn of the century involves a coalition among local, state and federal agencies.
- 1992 - Metropolitan Washington Council of Governments and the AWRC produced a "Blueprint for the Restoration of the Anacostia Watershed" which laid out plans for individual restoration projects for 16 sub-watersheds, including stormwater retrofits, stream restoration, fish passage, reforestation and wetlands creation.
- 1993 - Functional Master Plan for the Patuxent River Watershed - recommended steps for developing and implementing water quality criteria, more restrictive stream buffers and more effective agricultural and urban BMPs.
- 1995 - Clinton Administration has designated the Anacostia River a priority ecosystem and the US EPA has established a Five-Point Action Plan to restore the watershed.
- 1995 - Limited Amendment to the Eastern Montgomery County Master Plan - Adds substantially to current park acquisition plans for the Paint Branch Stream Valley Park system to maintain low imperviousness levels, cool water temperatures and baseflow in the trout spawning reaches of upper Paint Branch.

These policies have been supported and encouraged by legislation, regulation, inter-jurisdictional agreements and master plans at various levels, including:

driveways that did not appear in the GIS database.

Table 2 shows the estimated impervious cover for each of the subwatersheds in eastern Montgomery County, grouped by watershed for 1990. It also shows the proportion of each subwatershed in forest and wetland cover and an estimate of the propprtidnoft-he subwatershed that is developable. In addition, Table 2 summarizes the impervious cover 'Within each subwatershed if development build-out occurs under the 1981 Master Plan zoning. The Upper Paint Branch Watershed Planning Study, which is based on the Paint Branch portion of this analysis, offers more background information. It also describes healthy stream ecosystem characteristics, common sources of ecosystem degradation and how degradation of a stream system can be avoided or reduced; some of this is summarized in the Appendix.

Tables 3 through 7 summarize past and present conditions that have been documented by various agencies in eastern Montgomery County subwatersheds.

Water Quality and Habitat Conditions in the Anacostia Tributaries of Eastern Montgomery County

The Anacostia watershed has undergone two waves of change to its land use. In the 1800s, much of the original forest was cleared to support agricultural uses, particularly tobacco farming. Then in the 1950s, the area underwent major suburbanization, becoming a residential community of the expanding Washington metropolitan area. A USGS report (Yorke and Herb, 1978) indicated that suspended solids transported from the Anacostia Basin averaged 13,400 tons per year between 1962 - 1974. Development of the watershed

- The Federal Water Pollution Control Act of 1948 for regulating dumping and disposal into navigable waters.
- The Water Quality Act of 1965, which created ambient water quality standards for interstate waters.
- The 1972 Federal Clean Water Act and 1977, 1981 amendments, for preservation of fishable and swimmable waters of the U.S.
- The Maryland Water Resources Law.
- The Chesapeake Bay Agreement of 1983 is a commitment by the states of Pennsylvania, Maryland, and Virginia, the District of Columbia, and the U.S. EPA to restore and protect the Bay through correcting existing pollution problems and avoiding new ones.
- 1983 - Section 208 Water Quality Mangement Plan by the state, in compliance with that section of the Federal Clean Water Act.
- Montgomery County enacts stormwater management requirements for water quality and quantity control in 1983.
- Montgomery County Planning Board approves stream buffer guidelines in 1983 (updated in 1993) to protect streams from non-point source pollution.
- DEP continues to administer stream restoration and stormwater management retrofit projects through the County.
- The State Planning Act of 1992, in which one of the seven visions given states that stewardship of the Cheseapeake Bay is to be considered a universal ethic. The planning act also requires inclusion of a sensitive areas element protecting 100-year floodplains, streams and their buffers, habitats of threatened and endangered species and steep slopes in all master plans by July 1997. All master plans must be updated at least every five years after 1997.
- The 1992 Chesapeake Bay Agreement requires a 40 percent reduction in controllable nutrient loads (nitrogen and phosphorus) to the Bay from the 1985 level by the year 2000. The state initiates the tributary strategies program to customize nutrient reduction plans for different sub-watersheds. Montgomery County has two tributary plans (Middle Potomac and Patuxent) which will focus on a combination of urban and agricultural non-point source best management practices (BMPs) to reduce pollution from runoff.
- 1992 County Forest Conservation Law - provides for tree preservation and planting in new developments; forest is protected with conservation easements.
- 1993 General Plan Refinement - Three of the 14 environmental goals contained in that document were protection and improvement of water quality; conservation of County waterways, wetlands and sensitive parts of stream valleys; and, comprehensive stormwater management to minimize sedimentation.
- 1994 - Anacostia River was listed as a threatend river by American Rivers, a national conservation organization dedicated to protecting and improving American rivers. The designation is an upgrade over its 1993 status as endangered and reflects the extensive efforts of many jurisdictions to restore the river system.
- 1994 Clarksburg Master Plan & Hyattstown Special Study Area - first master plan to utilize the special protection area concept; designated the Little Seneca Creek and part of Ten mile Creek watershed as SPAs.
- The County creates regulations in 1995 for special protection area performance standards that are intended to maintain baseflow, wetland and aquatic habitat functions, and groundwater recharge.

1990 Land Cover Conditions

Table 2

Subwatershed	Size of Subwatershed (Acres)	1990 % Imperviousness	1990 Existing + Pipeline % Imperviousness	% Imperviousness from Developable Land Under 1981 Zoning	Existing + Pipeline + Developable % Imperviousness Under 1981 Master Planned Zoning	% Imperviousness from Master Planned Roads[1]	1981 Master Plan Build-out % Imperviousness	Percent of Subwatershed in:		
								Developable Land	Forest Cover	Wetland Cover[2]
PAINT BRANCH										
Left Fork	1,400	12.1	12.4	2.2	14.6	N/A	14.6	25.2	19.9	2.6
Right Fork	941	9.6	10.4	4.4	14.8	N/A	14.8	46.9	21.7	3.0
Good Hope	986	9.8	10.4	2.4	12.8	1.7	14.5	30.6	54.4	1.8
Gum Springs	624	15.6	17.5	0.2	17.7	0.6	18.3	3.8	24.6	0.4
Fairland Farms	198	11.8	12.6	2.5	15.1	N/A	15.1	15.0	15.2	1.3
Hollywood Branch	996	24.1	24.3	0.0	24.3	N/A	24.3	0.0	13.6	0.2
West Farm	727	17.9	35.6	16.9	52.5	N/A	52.5	23.8	20.5	0.3
Mainstem	3,828	21.0	21.5	1.1	22.6	0.3	22.9	3.5	29.2	2.3
LITTLE PAINT BRANCH										
Silverwood	1,295	15.1	18.0	6.8	24.8	N/A	24.8	21.2	40.5	0.7
Galway	622	24.5	26.4	0.5	26.9	N/A	26.9	1.2	15.8	0.5
Tanglewood	631	23.5	23.8	8.1	31.9	1.9	33.8	24.4	31.5	0.4
Greencastle	901	29.7	32.6	5.7	38.3	0.6	38.9	14.6	20.1	1.8
NORTHWEST BRANCH										
Hampshire Greens	709	5.3	8.7	0.5	9.2	N/A	9.2	7.1	34.0	1.3
Mainstem	5,147	16.0	16.5	0.3	16.8	0.5	17.3	1.5	21.5	1.5
Johnson Rd	498	8.0	11.5	1.8	13.3	0.3	13.6	25.7	32.3	0.4
Bryants Nursery Run	1,030	7.9	11.2	1.7	12.9	2.1	15.0	23.4	39.4	0.2
SLIGO CREEK	626	31.3	N/C	N/C	N/C	N/A	N/C	N/C	10.5	0.0

1990 Land Cover Conditions (cont.)

Subwatershed	Size of Sub-watershed (Acres)	1990 % Imper-viousness	1990 Existing + Pipeline % Imper-viousness	% Imper-viousness from Develop-able Land Under 1981 Zoning	Existing + Pipeline + Develop-able % Imper-viousness Under 1981 Master Planned Zoning	% Imper-vious-ness from Master Planned Roads[1]	1981 Master Plan Build-out % Imper-vious-ness	Percent of Subwatershed in:		
								Develop-able Land	Forest Cover	Wetland Cover[2]
PATUXENT										
Belle Cote	723	9.5	9.5	2.7	12.2	N/A	12.2	44.8	47.7	0.8
Burtonsville Park	442	4.5	4.5	2.0	6.5	N/A	6.5	49.2	45.0	0.1
Spencerville Rd	449	5.6	6.5	1.3	7.8	N/A	7.8	26.7	55.2	3.5
Dustin Rd	425	8.4	8.4	1.3	9.7	N/A	9.7	36.3	41.7	2.2
Main East	293	5.3	5.3	0.6	5.9	N/A	5.9	13.6	61.8	3.2
Rocky Gorge	963	7.7	10.2	1.4	11.6	N/A	11.6	32.6	42.2	1.9
Millgrove	1,161	6.8	7.6	0.9	8.5	N/A	8.5	24.5	32.6	2.3
Main West	190	3.1	3.4	1.0	4.4	N/A	4.4	22.3	63.7	2.9

Source: Data based on GIS analysis of 1990 conditions
N/A - Not applicable N/C - Not calculated
1. Master planned roads include only Briggs Chaney Road realignment at MD 650, MD 28-MD 198 connector, and a 6-lane Intercounty Connector.

2. Wetlands coverage is based on MD DNR non-tidal wetlands data for 1988.

Summary of Northwest Branch Water Quality Monitoring

Table 3

Parameters Studied	Year of Data Collection	Agency (Source)	Sampling Method	Analysis Method	Stream Condition Characterization	Northwest Branch Subwatersheds		
						Hampshire Greens Trib.	Bryants Nursery Trib.	Mainstem
Macro-invertebrates	1989	MWCOG (Kumble, 1990)	Surber, 2 sq. ft.	Modified RBP III; 6 metrics[1]	Good/Fair/Poor		•Norwood Rd (GOOD)	•Randolph Rd (GOOD) •Rt 29 (FAIR)
	1989	ICPRB (Stribling et.al., 1990)	Surber, 2 sq. ft.	RBP II; 7 metrics. EPD analysis[2]	Excellent/Good/Fair/Poor		•Norwood Rd (EXCEL)	•Randolph Rd (FAIR) •Rt 29 (FAIR)
	1990	ICPRB (Cummins et.al., 1991)	Surber, 2 sq. ft.	RBP II; 7 metrics. EPD analysis[2]	Excellent/Good/Fair/Poor			•Layhill Park (EXCEL)
	1993	M-NCPPC EPD (1993)	D-net, 300 seconds	RBP II; 7 metrics. EPD analysis[2]	Excellent/Good/Fair/Poor	•Old Orchard Rd (EXCEL)		•Bonifant Rd (FAIR) •Randolph Rd (FAIR) •Rt 29 (FAIR)
	1996	M-NCPPC EPD (1996)	D-net, 2 sq. meter	RBP II; qualitative assessment in field	Excellent/Good/Fair/Poor		•Duxbury Rd. (EXCEL)	•Johnson Rd. Trib. at Notley Rd. (EXCEL)
Fish (excludes MD. DNR data)	1988	MWCOG (Herson et.al., 1989) ICPRB (Cummins, 1989)	Seine hauls	Fish diversity comparisons. MWCOG ratings[3]	Excellent/Good/Fair/Poor		•Norwood Rd (EXCEL)	•Randolph Rd (GOOD) •Rt 29 (FAIR) •Rt 650 (GOOD)
	1990	ICPRB (Cummins et.al., 1991)	Electroshock	RBP V; IBI, 8 metrics[4]	Excellent/Good/Fair/Poor			•Layhill Park (EXCEL)
Chemical and Physical Water Quality	1972	MCDEP (1974)	Grab samples	9 parameters[5]	Excellent/Good/Fair/Poor			•Upper (GOOD) •Lower (FAIR) •Bel Pre Cr (GOOD)
	1973	MCDEP (1974)	Grab samples	9 parameters[5]	Excellent/Good/Fair/Poor			•Upper (GOOD) •Lower (FAIR) •Bel Pre Cr (GOOD)
	1974-1975	MCDEP (1976)	Grab samples	9 parameters[5]	Excellent/Good/Fair/Poor			•Upper (EXCEL) •Lower (GOOD) •Bel Pre Cr (EXCEL)
	1976	MCDEP (1977)	Grab samples	9 parameters[6]	Excellent/Good/Fair/Poor			•Upper (FAIR) •Lower (FAIR) •Bel Pre Cr (FAIR)
	1977	MCDEP (1978)	Grab samples	9 parameters[6]	Excellent/Good/Fair/Poor			•Upper (GOOD) •Lower (FAIR) •Bel Pre Cr (GOOD)
	1978	MCDEP (1979)	Grab samples	9 parameters[6]	Excellent/Good/Fair/Poor			•Upper (FAIR) •Lower (FAIR) •Bel Pre Cr (FAIR)
	1979	MCDEP (1980)	Grab samples	9 parameters[6]	Excellent/Good/Fair/Poor			•Upper (FAIR) •Lower (FAIR) •Bel Pre Cr (FAIR)

Summary of Northwest Branch Water Quality Monitoring (cont.)

Parameters Studied	Year of Data Collection	Agency (Source)	Sampling Method	Analysis Method	Stream Condition Characterization	Northwest Branch Subwatersheds		
						Hampshire Greens Trib.	Bryants Nursery Trib.	Mainstem
	1980	MCDEP (1981)	Grab samples	9 parameters[6]	Excellent/Good/Fair /Poor			•Upper (FAIR) •Lower (FAIR) •Bel Pre Cr (FAIR)
	1985	MWCOG (1987)	Grab samples	4 parameters[7]	Good/Fair/Poor			•Riggs Rd (FAIR TO GOOD)
	1986 & 1987	MWCOG (1989a)	Grab samples	5 parameters[8]	Excellent/Good/Fair /Poor			•Riggs Rd (GOOD)
	1988	ICPRB (Cummins, 1989)	Grab samples	4 parameters[9]	No rating provided		•Norwood Rd[9]	•Randolph Rd[9] •Rt 29[9] •Rt 650[9]
	1989	ICPRB (Stribling et.al., 1990)	Grab samples	10 parameters[10]	Good/Fair/Poor		•Norwood Rd (FAIR)	•Randolph Rd (GOOD) •Rt 29 (FAIR)
	1990	ICPRB (Cummins et.al., 1991)	Grab samples	6 parameters[11]	No rating provided			•Layhill Park[11]

1. RBP III (EPA's Rapid Bioassessment Protocol, level III) is a genus level study on the benthic macroinvertebrate (aquatic insect) community, which entails scoring 6 different macroinvertebrate community attributes (metrics) at each site and comparing those scores to a reference (best condition) site to get a consistent and standardized assessment of all sites throughout the study. MWCOG examined the RBP III data collected and analyzed by ICPRB in 1989 and then developed the stream condition characterization breakdown.

2. RBP II (EPA's Rapid Bioassessment Protocol, level II) is a family level study on the benthic macroinvertebrate (aquatic insect) community. The Environmental Planning Division analyzed data from the source indicated, which involved transposing a mix of genus and family level macroinvertebrate data into a consistent set of family level data for all the sites and then performed a RBP II (family level) analysis. The RBP II analysis entails scoring 7 different macroinvertebrate community attributes (metrics) at each site and comparing those scores to a reference (best condition) site to get a consistent and standardized assessment of all sites throughout the study.

3. Fish diversity comparisons involved comparing the diversity of fish communities from different stream sites throughout the Anacostia River basin. Ratings are based on a MWCOG breakdown: 0 - 5 fish species = POOR, 5 - 10 species = FAIR, 10 - 15 species = GOOD, and 15 - 25 species = EXCELLENT.

4. A RBP V (EPA's Rapid Bioassessment Protocol, level V) is a species level study of the fish community. An Index of Biological Integrity (IBI) is used as an analysis procedure, similar to RBP II & III, which involves assigning values for 8 different fish community attributes (metrics) for each site, and then comparing those values with a reference (best condition) site to get a consistent and standardized assessment for all sites throughout the study.

5. The 9 parameters assessed by MCDEP in the years 1972 through 1975 included; mean water temperature, mean dissolved oxygen, mean pH, mean biochemical oxygen demand (BOD), mean turbidity, mean total coliform, mean fecal coliform, mean total nitrate/nitrite, and mean total phosphates. Stream condition characterization for 1972 through 1975 was based on a combination of assessments and comparisons of the average values of the 9 water quality parameters for all the sites on each stream, which included; assessing violations of State water quality criteria, assessing sites which exhibited poor water quality, comparisons of the various parameters between streams, and professional judgement of DEP staff.

6. The 9 parameters assessed by MCDEP in the years 1976 through 1980 included; mean water temperatures, mean dissolved oxygen, mean pH, mean BOD, mean total phosphates, mean nitrate/nitrite, mean turbidity, mean total suspended solids, and mean fecal coliform bacteria concentrations. Stream condition characterization for 1976 through 1980 was based on a Water Quality Index (for further information and explanation see the MCDEP Environmental Reports for those years or see the EPA publication: EPA-907/9-74-001, Feb 1974).

Summary of Northwest Branch Water Quality Monitoring (cont.)

Table 3

7. The 4 parameters assessed by MWCOG in 1985 included; mean total suspended solids, mean fecal coliforms, mean nitrate, mean total phosphorous concentrations. Stream condition characterization was based on professional judgement.

8. The 5 parameters assessed by MWCOG in 1986 & 1987 included the mean values from May through September for; water temperature, pH, total suspended solids, fecal coliform, and nitrate. The stream condition characterization was based on a water quality index developed by ICPRB in 1979 which assigns a score for the mean for each parameter, and then based on this total score, assigns a rating for the particular sample site.

9. The 4 parameters collected by ICPRB in 1988 included; water temperatures, pH, dissolved oxygen, and conductivity. No stream rating or characterization was furnished in the study report, however a discussion of the relative significance of the values of the 4 parameters was provided in the report and is summarized in the following: Norwood Rd - all four parameters were within normal limits during spring, summer and fall sampling events; Randolph Rd - all four parameters were within normal limits during spring, summer and fall sampling events; Rt 29 - pH, DO, and conductivity were all normal during spring, summer, and fall sampling events, and water temperature was normal during spring and fall, but was unusually high in the summer; Rt 650 - all four parameters were within normal limits during spring, summer and fall sampling events.

10. The 10 parameters assessed by ICPRB in 1989 included; mean water temperature, mean dissolved oxygen, mean pH, mean turbidity, mean total suspended solids, mean total dissolved solids, mean ammonia, mean conductivity, mean total coliforms, and mean fecal coliform. Stream condition characterization was based on professional judgement.

11. The 6 parameters assessed by ICPRB in 1990 included; water temperature, pH, total dissolved solids, turbidity, dissolved oxygen, and coliform bacteria concentrations. No stream rating or characterization was furnished as part of the study report, however a discussion of the relative significance of the values of the parameters was provided in the report and is summarized in the following: the Layhill Rd site on the Northwest Branch had all parameters within acceptable limits except for the coliform concentrations which chronically exceeded the recommended limit set in State water quality standards.

the Anacostia Basin averaged 13,400 tons per year between 1962 - 1974. Development of the watershed has greatly altered the hydrology of the river and its tributaries. Point source pollution in the form of sewage and industrial discharges in the '50s, '60s and early '70s was a major culprit in stream degradation. Today, non-point source pollution in agricultural and urban stormwater runoff are the chief contributors. Lakes and ponds have also been affected with eutrophication[4], elevated water temperatures and accumulations of toxic hydrocarbons, PCBs and heavy metals.

The Anacostia Watershed Restoration Project is a regional effort to protect and enhance water quality in the Anacostia River including the Northwest Branch, Paint Branch, Silgo Creek and Little Paint Branch watersheds. This effort was initiated under the Anacostia Watershed Restoration Agreements of 1984 and 1987 and has involved local projects in the various Anacostia subwatersheds in Montgomery and Prince George's Counties and the District of Columbia. Currently in Montgomery County, the U.S. Army Corps Engineers is undertaking a feasibility study in cooperation with local and regional agencies to determine stream enhancement and water quality/quantity retrofit opportunities in the Northwest Branch watershed. MCDEP is studying potential improvements in the upper Paint Branch.

Northwest Branch

As with most of the Anacostia tributaries, Northwest Branch has varied water quality along its length, with the upper portions in better condition as a general rule. Its upper headwater streams in Cloverly and Sandy Spring/Ashton are generally of high quality. Although these headwater streams do not support naturally-reproducing trout populations, the streams still sustain diverse, environmentally-sensitive aquatic communities, including aquatic macroinvertebrates. These diverse macroinvertebrate communities indicate generally good to excellent stream conditions in upper Northwest Branch streams (see Table 3, page 22); M-NCPPC found healthy, diverse aquatic macroinvertebrate communities and high quality aquatic habitat in the very limited monitoring that was conducted in the summers of 1993 and 1996. As a Use IV stream system, the Northwest Branch in Montgomery County supports a put-and-take brown trout fishery. The trout population is continually stocked by DNR although there are some adult trout which survive for more than one year.

The headwaters area in Cloverly is defined as the Hampshire Greens, Bryants Nursery Run, Ednor Road, and Johnson Road sub-watersheds, as well as the mainstem at and upstream of Johnson Road (see Figure 5, page 26). Imperviousness for 1990 ranges from about 5 to 8 percent in these sub-watersheds (see Table 2, page 20). The headwater streams in Northwest Branch tend to be siltier and carry a higher sediment load than the headwater streams in Paint Branch. Some of the streams that appear to have moderate silt and sediment loading include those in the Bryants Nursery and Johnson Road subwatersheds. This is due to a combination of factors, including soils and geology. The Northwest Branch watershed contains more erodible soils than the Paint Branch watershed and may be particularly sensitive to changes in cover conditions: for example, in the upper headwater area of Northwest Branch within Cloverly (which includes the Johnson Road, Bryants Nursery Run, and Hampshire Greens subwatersheds), roughly 29 percent of the soils are defined as highly erodible using Soil Conservation Service criteria; and about 18 percent of the soils in upper Paint Branch (defined as the Good Hope, Gum Springs, Right Fork, Left Fork, and Fairland Farms subwatersheds) are defined as highly erodible. In addition, agricultural uses in the upper Northwest Branch, which typically involve ongoing land cover disturbances and create significant sediment loads to streams, cover a larger area than in upper Paint Branch.

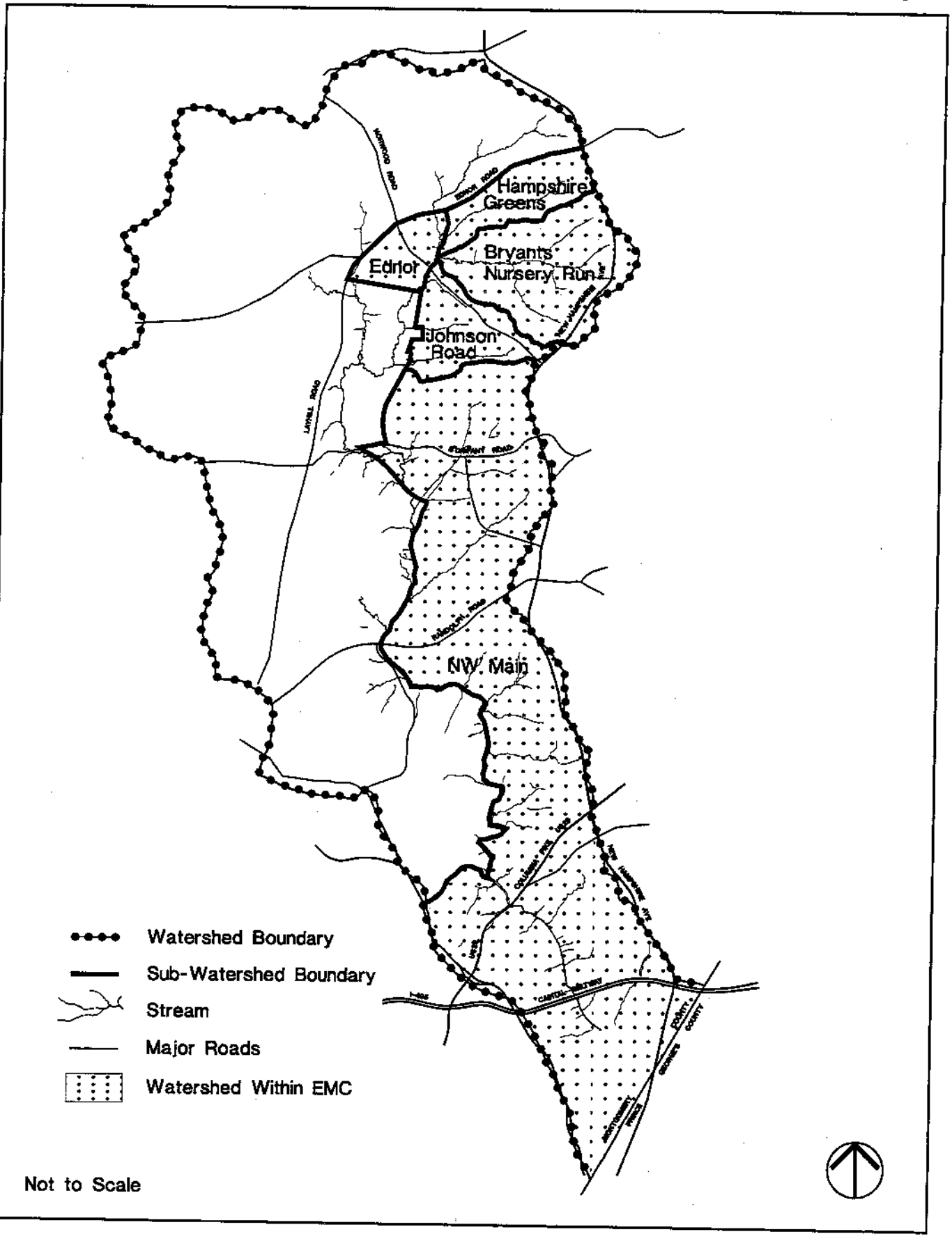
Efforts to protect the high quality conditions in the headwater streams of the Northwest Branch should focus on maintaining low density land uses, as well as providing stormwater management and sediment controls for new development consistent with the Use IV stream designation. This would include preserving stream and wetlands buffers, reforesting buffer areas where forest does not exist, and identifying and implementing retrofit projects and agricultural BMPs to reduce sedimentation and correct existing problems.

Farther downstream, in the vicinity of Randolph Road, where a greater proportion of the watershed is developed (see Table 2, page 20), the quality of Northwest Branch is not as high as in the upstream sections (see Table 3, page 22). Extensive sand bars occur on the inside of meanders as well as in mid-channel in the mainstem. Severe undercutting of stream banks and especially of outside meanders has made the banks essentially vertical, and lateral erosion and ongoing channel widening are evident. As with any

[4] Nutrient enrichment (especially of nitrogen and phosphorus) which promotes increased oxygen demand from the biological blooms it stimulates. When excessive, this can lead to rapid depletion of dissolved oxygen and turbidity, among other negative impacts.

Northwest Branch

Figure 5



streams, the mainstem channel is in a dynamic state, changing its shape and size in response to base and storm flow fluctuations resulting from development in the watershed. Stream banks therefore bear the marks of absorbing the energy of floods allowed little dissipation over floodplains.

Downstream conditions are further aggravated by the use of three-wheeled all-terrain vehicles, the presence of exposed (sometimes leaking) sewer lines and eroding trails, the dumping of trash and debris, and the removal of stabilizing streamside vegetation. Most of the time, fecal coliform counts exceed state standards (U.S. Army Corps of Engineers, 1994). Less diverse and more pollution tolerant aquatic life is supported in the lower sections of the stream especially in the slower, unshaded, channelized urban sections, and most of the fish species found there are tolerant of poor water quality and sedimentation.

As seen in Table 2, page 20, impervious cover within most of the Northwest Branch subwatersheds are projected under the 1981 master plan zoning to remain within the 10 to 15 percent range that is generally considered as the impervious cover limits for protecting coldwater streams in Maryland. Therefore, the 1981 master plan land uses, in combination with regulatory environmental requirements, standards, and guidelines, are expected to provide appropriate protection for Northwest Branch within Cloverly.

The mainstem subwatershed (roughly the area draining the mainstem downstream of Johnson Road) is estimated to have a subwatershed imperviousness of 16 percent in 1990. Because most of the land in this part of Northwest Branch has been developed, it is projected to increase by only about 1.3 percent (see Table 2, page 20). Since opportunities to significantly change the mainstem's subwatershed characteristics are very limited, given the small proportion of remaining developable land within the subwatershed, no changes in the 1981 master plan land uses are recommended. To enhance protection of the natural resources within the mainstem watershed, strict implementation and enforcement of regulatory environmental requirements and standards, and application of guidelines are recommended for any new development or redevelopment projects. In addition, programs and projects which identify and implement stormwater management retrofits and stream restoration in a timely manner should also be pursued.

Sligo Creek

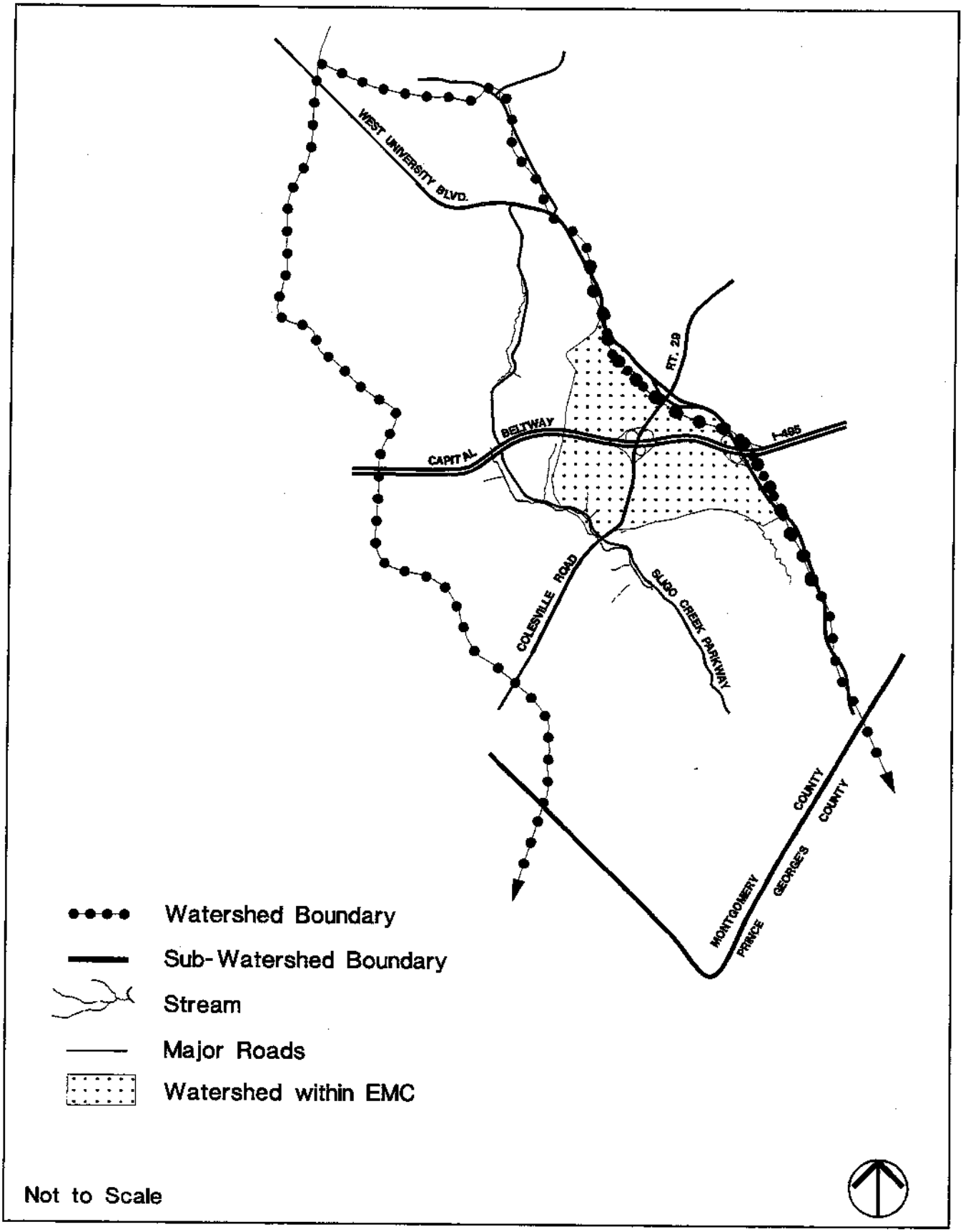
Only a small portion of the Sligo Creek watershed is within eastern Montgomery County (in the Four Corners planning area, see Figure 6, page 28). Ratings by different studies of Sligo Creek's overall quality range from poor to fair-good (see Table 4, page 29). Such ratings are typical of streams which drain relatively urbanized land that have relatively high impervious cover. The 1990 impervious cover for Sligo Creek within eastern Montgomery County is about 31.3 percent (see Table 2, page 20). Predominant commercial and suburban land uses have resulted in high overall imperviousness in the subwatershed. Many of its tributaries have disappeared, starved of their supply of rainwater. The majority of development took place prior to implementation of stormwater management controls. Storm water is typically conveyed directly into the stream by storm drains. Excessive stormwater runoff often alters the flow significantly, causing extensive bottom scouring and bank erosion and loss of trees, along with adverse fluctuations in biological and chemical conditions. Though temperature and dissolved oxygen levels have been within the Use I water quality standards, fecal coliform bacteria counts have been consistently high (probably due to contamination which commonly leaches from the adjacent sewer line), particularly during heavy flows (U.S. Army Corps of Engineers, 1994).

Sligo Creek, a Use I stream, was not capable of supporting a diverse fish community until recently when extensive restoration of the headwaters was undertaken by various agencies including MCDEP, MDE and M-NCPPC. The water quality is sufficiently high to permit survival of a variety of aquatic species but physical barriers to fish migration, in addition to erratic variations between baseflow and storm flow volumes and velocities, have limited Sligo Creek's fish community. These impacts on the fish population are the reason for its historical reputation as the worst tributary of the Anacostia. Very few macroinvertebrates or aquatic plants are resident, and the few species occurring are pioneer species (i.e., are tolerant of siltation, low water quality and/or low base flow).

Restoration of the creek is an ongoing effort, with over $2 million already invested by state and local government. Montgomery County DEP has constructed four major retrofit projects, including the innovative Wheaton Branch stormwater management retrofit facility that was constructed near Dennis Avenue (upstream of the Four Corners planning area), and has restocked part of the stream with native fish and

Sligo Creek

Figure 6



Summary of Sligo Creek Water Quality Monitoring

Table 4

Parameters Studied	Year of Data Collection	Agency (Source)	Sampling Method	Analysis Method	Stream Condition Characterization	Condition of Sligo Creek Mainstem
Macro-invertebrates	1989	MWCOG (Kumble, 1990)	Surber, 2 sq. ft.	Modified RBP III; 6 metrics[1]	Good/Fair/Poor	•Near Sligo Park Golf Course (POOR) •Rt 650 (POOR)
	1989	ICPRB (Stribling et.al., 1990)	Surber, 2 sq. ft.	RBP II; 7 metrics. EPD analysis[2]	Excellent/Good/ Fair/Poor	•Near Sligo Park Golf Course (POOR)
	1990	ICPRB (Cummins et.al., 1991)	Surber, 2 sq. ft.	RBP II; 7 metrics. EPD analysis[2]	Excellent/Good/ Fair/Poor	•University Blvd (FAIR) •Rt 650 (POOR)
	1993	M-NCPPC EPD (1993)	D-net, 300 seconds	RBP II; 7 metrics. EPD analysis[2]	Excellent/Good/ Fair/Poor	•Rt 29 (POOR)
Fish - (excludes MD. DNR data)	1988	MWCOG (Herson et.al., 1989) ICPRB (Cummins, 1989)	Seine hauls	Fish diversity comparisons. MWCOG ratings[3]	Excellent/Good/ Fair/Poor	•Near Sligo Park Golf Course (POOR) •Rt 650 (POOR)
	1990	ICPRB (Cummins et.al., 1991)	Electro-shock	RBP V; IBI, 8 metrics[4]	Excellent/Good/ Fair/Poor	•University Blvd (POOR) •Rt 650 (Long Branch) (POOR)
Chemical and Physical Water Quality	1972	MCDEP (1974)	Grab samples	9 parameters[5]	Excellent/Good/ Fair/Poor	•University Blvd (FAIR) •Rt 29 (FAIR) •Carroll Ave (FAIR)
	1973	MCDEP (1974)	Grab samples	9 parameters[5]	Excellent/Good/ Fair/Poor	•University Blvd (FAIR) •Rt 29 (FAIR) •Carroll Ave (FAIR)
	1974-1975	MCDEP (1976)	Grab samples	9 parameters[5]	Excellent/Good/ Fair/Poor	•University Blvd (FAIR) •Rt 29 (FAIR) •Carroll Ave (FAIR)
	1976	MCDEP (1977)	Grab samples	9 parameters[6]	Excellent/Good/ Fair/Poor	•University Blvd (FAIR) •Rt 29 (FAIR) •Carroll Ave (FAIR)
	1977	MCDEP (1978)	Grab samples	9 parameters[6]	Excellent/Good/ Fair/Poor	•University Blvd (FAIR) •Rt 29 (FAIR) •Carroll Ave (FAIR)
	1978	MCDEP (1979)	Grab samples	9 parameters[6]	Excellent/Good/ Fair/Poor	•University Blvd (FAIR) •Rt 29 (FAIR) •Carroll Ave (FAIR)
	1979	MCDEP (1980)	Grab samples	9 parameters[6]	Excellent/Good/ Fair/Poor	•University Blvd (FAIR) •Rt 29 (FAIR) •Carroll Ave (FAIR)
	1980	MCDEP (1980)	Grab samples	9 parameters[6]	Excellent/Good/ Fair/Poor	•University Blvd (FAIR) •Rt 29 (FAIR) •Carroll Ave (FAIR)
	1985	MWCOG (1987)	Grab samples	4 parameters[7]	Good/Fair/Poor	•Sligo Cr @ Carroll Ave (FAIR) •Long Br @ Carroll Ave (FAIR-GOOD)

Summary of Sligo Creek Water Quality Monitoring (cont.)

Table 4

Parameters Studied	Year of Data Collection	Agency (Source)	Sampling Method	Analysis Method	Stream Condition Characterization	Condition of Sligo Creek Mainstem
	1986 & 1987	MWCOG (1989a)	Grab samples	5 parameters[8]	Excellent/Good/ Fair/Poor	•Carroll Ave (FAIR-GOOD)
	1988	ICPRB (Cummins, 1989)	Grab samples	4 parameters[9]	No rating provided	•Near Sligo Park Golf Course[9] •Rt 650[9]
	1989	ICPRB (Stribling et.al., 1990)	Grab samples	10 parameters[10]	Good/Fair/Poor	•Near Sligo Park Golf Course (FAIR) •Rt 650 (GOOD)
	1990	ICPRB (Cummins et.al., 1991)	Grab samples	6 parameters[11]	No rating provided	•Sligo Cr & Long Br confluence[11] •University Blvd[11]

1. RBP III (EPA's Rapid Bioassessment Protocol, level III) is a genus level study on the benthic macroinvertebrate (aquatic insect) community, which entails scoring 6 different macroinvertebrate community attributes (metrics) at each site and comparing those scores to a reference (best condition) site to get a consistent and standardized assessment of all sites throughout the study. MWCOG examined the RBP III data collected and analyzed by ICPRB in 1989 and then developed the stream condition characterization breakdown.

2. RBP II (EPA's Rapid Bioassessment Protocol, level II) is a family level study on the benthic macroinvertebrate (aquatic insect) community. The Environmental Planning Division analyzed data from the source indicated, which involved transposing a mix of genus and family level macroinvertebrate data into a consistent set of family level data for all the sites and then performed a RBP II (family level) analysis. The RBP II analysis entails scoring 7 different macroinvertebrate community attributes (metrics) at each site and comparing those scores to a reference (best condition) site to get a consistent and standardized assessment of all sites throughout the study.

3. Fish diversity comparisons involved comparing the diversity of fish communities from different stream sites throughout the Anacostia River basin. Ratings are based on a MWCOG breakdown: 0 - 5 fish species = POOR, 5 - 10 species = FAIR, 10 - 15 species = GOOD, and 15 - 25 species = EXCELLENT.

4. A RBP V (EPA's Rapid Bioassessment Protocol, level V) is a species level study of the fish community. An Index of Biological Integrity (IBI) is used as an analysis procedure, similar to RBP II & III, which involves assigning values for 8 different fish community attributes (metrics) for each site, and then comparing those values with a reference (best condition) site to get a consistent and standardized assessment for all sites throughout the study.

5. The 9 parameters assessed by MCDEP in the years 1972 through 1975 included; mean water temperature, mean dissolved oxygen, mean pH, mean biochemical oxygen demand (BOD), mean turbidity, mean total coliform, mean fecal coliform, mean total nitrate/nitrite, and mean total phosphates. Stream condition characterization for 1972 through 1975 was based on a combination of assessments and comparisons of the average values of the chemical water quality parameters for all the sites on each stream, which included; assessing violations of State water quality criteria, assessing sites which exhibited poor water quality, comparisons of the various parameters between streams, and professional judgement of DEP staff.

6. The 9 parameters assessed by MCDEP in the years 1976 through 1980 included; mean water temperatures, mean dissolved oxygen, mean pH, mean BOD, mean total phosphates, mean nitrate/nitrite, mean turbidity, mean total suspended solids, and mean fecal coliform bacteria concentrations. Stream condition characterization for 1976 through 1980 was based on a Water Quality Index (for further information and explanation see the MCDEP Environmental Reports for those years or see the EPA publication: EPA-907/9-74-001, Feb 1974).

7. The 4 parameters assessed by MWCOG in 1985 included; mean total suspended solids, mean fecal coliforms, mean nitrate, mean total phosphorous concentrations. Stream condition characterization was based on professional judgement.

8. The 5 parameters assessed by MWCOG in 1986 & 1987 included the mean values from May through September for; water temperature, pH, total suspended solids, fecal coliform, and nitrate. The stream condition characterization was based on a water quality index developed by ICPRB in 1979 which assigns a score for the mean for each parameter, and then based on the total score, assigns a rating for the particular sampling site.

Summary of Sligo Creek Water Quality Monitoring (cont.)

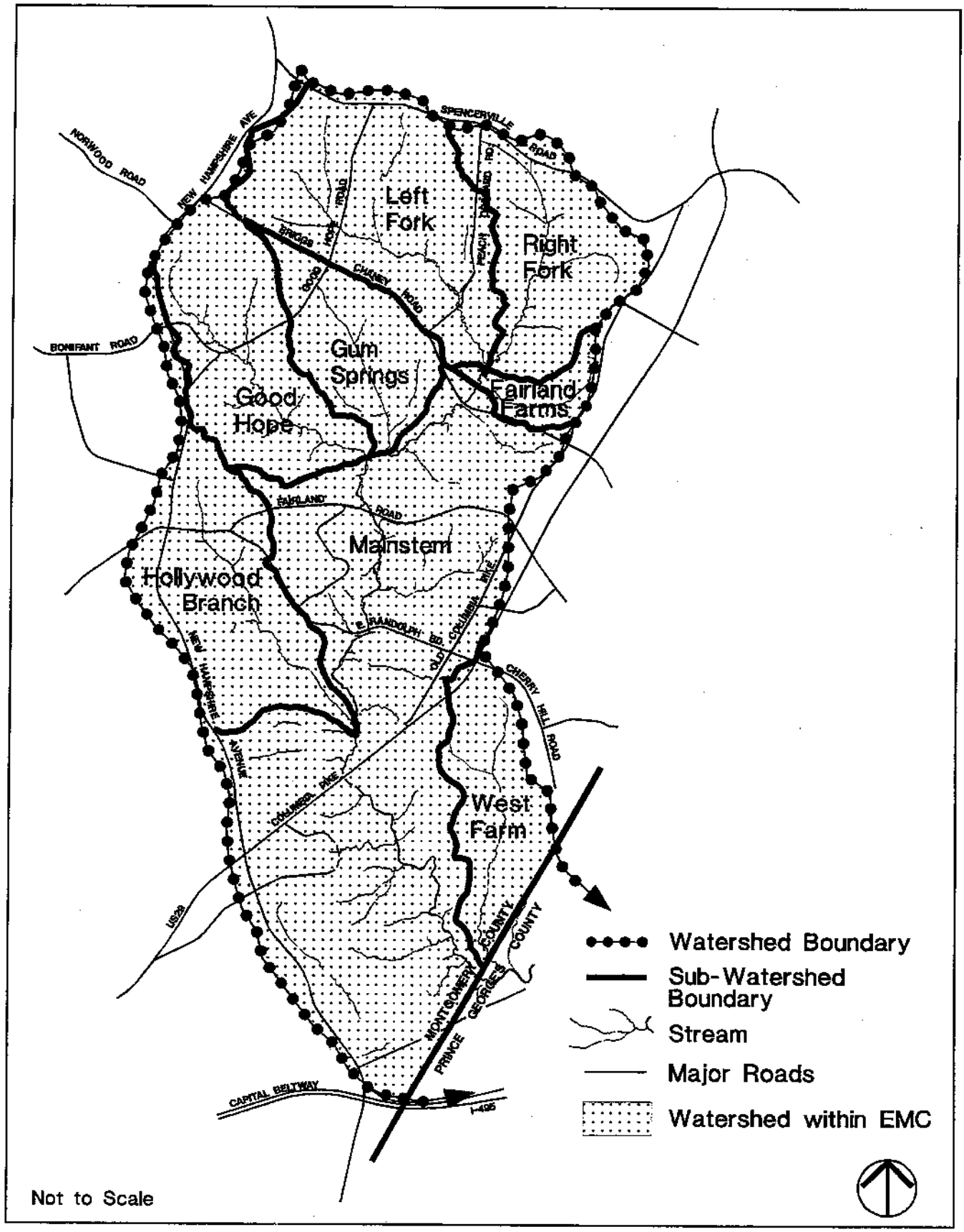
9. The 4 parameters collected by ICPRB in 1988 included; water temperatures, pH, dissolved oxygen, and conductivity. No stream rating or characterization was furnished in the study report, however a discussion of the relative significance of the values of the 4 parameters was provided in the report and is summarized in the following: Both the Rt 29 and Sligo Park Golf Course sites had pH, water temperatures, dissolved oxygen within normal limits during the spring, summer, and fall sampling events, however the conductivity levels at both sites were elevated in the spring and summer.

10. The 10 parameters assessed by ICPRB in 1989 included; mean water temperature, mean dissolved oxygen, mean pH, Mean turbidity, mean total suspended solids, mean total dissolved solids, mean ammonia, mean conductivity, mean total coliforms, and mean fecal coliform. Stream condition characterization was based on professional judgement.

11. The 6 parameters assessed by ICPRB in 1990 included; water temperature, pH, total dissolved solids, turbidity, dissolved oxygen, and coliform bacteria concentrations. No stream rating or characterization was furnished as part of the study report, however a discussion of the relative significance of the values of the parameters was provided in the report and is summarized in the following: the Sligo Creek site at University Blvd and the Sligo Creek & Long Branch confluence site both had all 6 parameters within acceptable limits except for the coliform concentrations which chronically met or exceeded the recommended limit in State water quality standards at both sites.

Paint Branch

Figure 7



macroinvertebrates. WSSC has taken steps to eliminate sewage overflow and leaks in the subwatershed.

These measures seem to be working, since the stream conditions for aquatic life have improved. Species monitoring immediately downstream of the Wheaton Branch SWM facility and in the stocked section of the stream in 1994 found sixteen species of fish, a significant improvement over a 1992 count of eight (U.S. Army Corps of Engineers, 1994), the 1988 count of two and a 1984 survey finding only one. In addition, several other aquatic species have become established in the self sufficient community now thriving in newly created vernal pools and wetlands. It is hoped these retrofit and restoration efforts continue to provide benefits to the stream system in the long term and are able to restore the stream's health on a permanent basis.

Table 2, page 20, shows that the Sligo Creek watershed within eastern Montgomery County is roughly 31.3 percent impervious. Because remaining developable land is very small, efforts to improve the quality of the stream system should continue to focus on identifying and implementing projects for stormwater management retrofits and stream restoration in a timely manner. Efforts to monitor and track the effectiveness of these projects over the long-term should also continue.

Paint Branch

The Paint Branch subwatershed lies mostly within Montgomery county (a small downstream portion lies within Prince Georges' County). Uses in eastern Montgomery County largely control what happens in the headwaters subwatersheds and a large portion of the mainstem (see Figure 7). Detailed characterization and evaluation of Paint Branch in eastern Montgomery County is provided in the Upper Paint Branch Watershed Study. The reader should refer to that study for detailed analysis and recommendations for preservation and protection of the high quality conditions and unique natural resource of the Paint Branch watershed.

The brown trout population serves as an indicator of high water quality in the subwatersheds of eastern Montgomery County. While the abundance of macroinvertebrates and other fish species has been measured , the trout is an easily recognized and well-established indicator. By virtue of its exceptional sensitivity to any adverse impacts, its presence signifies the high water and habitat quality of a stream; conditions which are likely to be more than adequate for the survival of species which form its food source, or are otherwise part of the cold water ecosystem. Likewise, the growth or decline of trout populations are an early indication of fluctuations in the health of the stream.

The relatively low impervious cover within the upper portions of the Paint Branch watershed has helped preserve the very high quality conditions in the important headwater streams (see Table 2, page 20).

Although upper Paint Branch is still of very high quality, long-term monitoring of the system, primarily by DNR-tracking of the brown trout fishery, is showing that the upper stream system is being stressed. These stressed conditions are being documented even at fairly low subwatershed imperviousness levels.

Downstream of Fairland Road, the streams in Paint Branch are generally of lower quality than upper Paint Branch (see Table 5, page 34). However, generally, conditions in lower Paint Branch are still of high enough quality to support adult trout. The lower quality in lower Paint Branch is largely due to the fact that a higher proportion of the lower watershed is developed, which is reflected in higher impervious cover (see Table 2, page 20). Much of the developed areas of lower Paint Branch pre-date stormwater management requirements, and surface water runoff from these areas flow largely uncontrolled and untreated to receiving streams.

The InterCounty Connector (ICC) master plan alignment currently crosses both the Good Hope and the Gum Springs tributaries, paralleling the Good Hope tributary for approximately 6000 feet. The draft environmental impact statement (EIS) for the proposed InterCounty Connector is considering the appropriate size, design and potential impact of locating this road at this and several other locations (in addition to no-build and upgrading of existing roads). The impact of the road on the protection of water quality will be evaluated during the draft EIS process.

Little Paint Branch

Many of the streams and the surrounding valleys in the Little Paint Branch have been degraded by surrounding development in the Route 29 corridor. Documented data on Little Paint Branch within Montgomery County indicate that the streams are generally in poor to fair condition (see Table 6, page 40). Most of the watershed within Montgomery County has relatively high impervious cover (see Table 2, page 20), reflecting fairly dense development that already exists. Some of this existing development, especially those areas built before the application of regulatory stream buffers, has resulted in a variety of adverse

Summary of Paint Branch Water Quality Monitoring

Table 5

Parameters Studied	Year of Data Collection	Agency (Source)	Sampling Method	Analysis Method	Stream Condition Characterization	Paint Branch Subwatersheds					
						Left Fork Trib.	Right Fork Trib.	Good Hope Trib.	Gum Springs Trib.	Hollywood Branch	Mainstem
Macro-invertebrates	1979-1980	MD. DNR (Hughes, 1980)	Not given in source.	Macro-invertebrate Diversity Index	3.00 - 4.00 = Excellent 2.00 - 3.00 = Good 1.00 - 2.00 = Fair 0.00 - 1.00 = Poor	Range = 1.88 - 2.16 (FAIR TO GOOD) Mean = 2.00	Range = 2.27 - 3.77 (GOOD TO EXCEL) Mean = 3.14	Range = 2.42 - 3.01 (GOOD TO EXCEL) Mean = 2.80			•Briggs Chaney Rd: Range= 2.00 - 2.43 (GOOD) Mean = 2.16 •Fairland Rd: Range= 1.65 - 2.65 (FAIR TO GOOD) Mean = 2.21 •Rt. 29: Range= 1.38 - 2.25 (FAIR TO GOOD) Mean = 1.90
	1980-1984	MD. DNR (Gougeon, 1985)	Not given in source.	Macro-invertebrate Diversity Index	3.00 - 4.00 Excellent 2.00 - 3.00 = Good 1.00 - 2.00 = Fair 0.00 - 1.00 = Poor	Range = 1.83 - 2.83 (FAIR TO GOOD)	Range = 1.69 - 3.56 (FAIR TO EXCEL)	•Upper: Range = 1.83 - 3.56 (FAIR TO EXCEL) •Lower: Range = 1.41 - 3.13 (FAIR TO EXCEL)	Range = 1.61 - 3.62 (FAIR TO EXCEL)		•Briggs Chaney Rd: Range= 1.36- 3.03, for 1980 to 3/82 only (FAIR TO EXCEL) •Fairland Rd: Range= 1.17 - 2.86 (FAIR TO GOOD) •Rt. 29: Range= 0.71 - 2.40 (FAIR TO GOOD)
	1989	MWCOG (Kumble, 1990)	Surber, 2 sq. ft.	Modified RBP III; 6 metrics[1]	Good/Fair/Poor						•Fairland Rd (GOOD) •Rt. 29 (GOOD)
	1989	ICPRB (Stribling et.al., 1990)	Surber, 2 sq. ft.	RBP II; 7 metrics. EPD analysis[2]	Excellent/Good/ Fair/Poor						•Fairland Rd (EXCEL) •Rt. 29 (GOOD)
	1990	ICPRB (Cummins et.al., 1991)	Surber, 2 sq. ft.	RBP II; 7 metrics. EPD analysis[2]	Excellent/Good/ Fair/Poor						•Randolph Rd (EXCEL)
	1990	MD. DNR (1990)	D-net, 90 seconds	RBP II; 7 metrics. EPD analysis[2]	Excellent/Good/ Fair/Poor	•Lower (GOOD)	•Upper (EXCEL)	•Upper (GOOD) •Lower (GOOD)	•Lower (FAIR)		•Fairland Rd (GOOD) •Rt. 29 (FAIR)
	1991	MD. DNR (1991)	D-net, 90 seconds	RBP II; 7 metrics. EPD analysis[2]	Excellent/Good/ Fair/Poor	•Lower (EXCEL)	•Upper (EXCEL)	•Upper (EXCEL) •Lower (EXCEL)	•Lower (GOOD)		•Fairland Rd (EXCEL) •Rt. 29 (FAIR)

Summary of Paint Branch Water Quality Monitoring (cont.)

Parameters Studied	Year of Data Collection	Agency (Source)	Sampling Method	Analysis Method	Stream Condition Characterization	Paint Branch Subwatersheds					
						Left Fork Trib.	Right Fork Trib.	Good Hope Trib.	Gum Springs Trib.	Hollywood Branch	Mainstem
	1992	MD. DNR (1992)	D-net, 90 seconds	RBP II; 7 metrics. EPD analysis[2]	Excellent/Good/ Fair/Poor	•Lower (EXCEL)	•Upper (EXCEL)	•Upper (EXCEL) •Lower (EXCEL)	•Lower (GOOD)		•Fairland Rd (EXCEL) •Rt. 29 (GOOD)
	1993	MD. DNR (1993)	D-net, 90 seconds	RBP II; 7 metrics. EPD analysis[2]	Excellent/Good/ Fair/Poor	•Lower (FAIR)	•Upper (EXCEL)	•Upper (GOOD) •Lower (GOOD)	•Lower (FAIR)		•Fairland Rd (GOOD) •Rt. 29 (POOR)
	1993	M-NCPPC EPD (1993)	D-net, 300 seconds	RBP II; 7 metrics. EPD analysis[2]	Excellent/Good/ Fair/Poor						•Above Randolph Rd (FAIR) •Below Randolph Rd (FAIR)
	1995	MCDEP	Kick, Seine net	Montgomery County protocol[3] compare to reference condition	Excellent/Good/ Fair/Poor	•Good	•Good to Excellent	•Good	•Good to Excellent		•Briggs Chaney (EXCELLENT) •Fairland Rd (GOOD)
Habitat Qualitative	1994-1995	MCDEP	Rapid assessment	Graph comparison	Optimal/Suboptimal /Marginal/Poor	•Suboptimal (1994)	•Suboptimal (1994)	•Suboptimal to Optimal (1994-1995)	•Suboptimal to Optimal (1994) •Optimal (1995)		•Briggs Chaney (SUBOPTIMAL 1994) •Fairland Rd (SUBOPTIMAL 1994-1995)
Habitat Quantitative	1994-1996	MCDEP	Mont. County protocol	Graph comparison	Flow, morphological description	To be published in Paint Branch SPA Conservation Plan					
Fish - (excludes MD. DNR data)	1988	MWCOG (Herson et.al, 1989) ICPRB (Cummins, 1989)	Seine hauls	Fish diversity comparisons. MWCOG ratings[4]	Excellent=15-25 species Good=10-15 species Fair = 5-10 species Poor = 0-5 species						•Rt. 29: 5-10 species (FAIR)
	1983, 1986, 1988	MWCOG (Kumble et.al., 1990)	Not given in source	Abundance of sensitive species	No rating provided			7 sensitive species out of 12 species collected, at 10% imperviousness		1 sensitive species out of 6 sps. collected at 25% imperv.	

Summary of Paint Branch Water Quality Monitoring (cont.)

Parameters Studied	Year of Data Collection	Agency (Source)	Sampling Method	Analysis Method	Stream Condition Characterization	Paint Branch Subwatersheds					
						Left Fork Trib.	Right Fork Trib.	Good Hope Trib.	Gum Springs Trib.	Hollywood Branch	Mainstem
	1990	ICPRB (Cummins et.al., 1991)	Electro-shock	RBP V; IBI, 8 metrics[5]	Excellent/Good/ Fair/Poor						•Below Randolph Rd (GOOD)
	1994-1995	MCDEP	Electro-shock	Pop estimate, 3 pass removal, IBI-reference condition, Montgomery County protocols	Excellent/Good/ Fair/Poor	•Good (1994)	•Fair to Excellent (1994)	•Fair to Good (1994) •Fair to Excellent (1995)	•Fair to Excellent (1994) •Excellent (1995)		•Briggs Chaney (GOOD 1994) •Fairland Rd. (GOOD 1994) •Fairland Rd. (EXCEL 1995)
Chemical and Physical Water Quality	1972	MCDEP (1974)	Grab samples	9 parameters[6]	Excellent/Good/ Fair/Poor						•Fairland Rd (EXCEL) •Powdermill Rd (EXCEL)
	1973	MCDEP (1974)	Grab samples	9 parameters[6]	Excellent/Good/ Fair/Poor						•Fairland Rd (GOOD) •Powdermill Rd (GOOD)
	1974-1975	MCDEP (1976)	Grab samples	9 parameters[6]	Excellent/Good/ Fair/Poor						•Fairland Rd (EXCEL) •Powdermill Rd (EXCEL)
	1976	MCDEP (1977)	Grab samples	9 parameters[7]	Excellent/Good/ Fair/Poor						•Fairland Rd (GOOD) •White Oak NSWC (GOOD) •Powdermill Rd (GOOD)
	1977	MCDEP (1978)	Grab samples	9 parameters[7]	Excellent/Good/ Fair/Poor						•Fairland Rd (FAIR) •White Oak NSWC (FAIR) •Powdermill Rd (FAIR)
	1978	MCDEP (1979)	Grab samples	9 parameters[7]	Excellent/Good/ Fair/Poor						•Fairland Rd (FAIR) •White Oak NSWC (FAIR) •Powdermill Rd (FAIR)
	1979	MCDEP (1980)	Grab samples	9 parameters[7]	Excellent/Good/ Fair/Poor						•Fairland Rd (FAIR) •White Oak NSWC (FAIR) •Powdermill Rd (FAIR)

Summary of Paint Branch Water Quality Monitoring (cont.)

Parameters Studied	Year of Data Collection	Agency (Source)	Sampling Method	Analysis Method	Stream Condition Characterization	Paint Branch Subwatersheds					
						Left Fork Trib.	Right Fork Trib.	Good Hope Trib.	Gum Springs Trib.	Hollywood Branch	Mainstem
	1980	MCDEP (1981)	Grab samples	9 parameters[7]	Excellent/Good/ Fair/Poor						•Fairland Rd (FAIR) •White Oak NSWC (FAIR) •Powdermill Rd (FAIR)
	1985	MWCOG (1987)	Grab samples	4 parameters[8]	Good/Fair/Poor						•Powdermill Rd (GOOD)
	1988	ICPRB (Cummins, 1989)	Grab samples	4 parameters[9]	No rating provided						•Rt. 29[9]
	1989	ICPRB (Stribling et.al., 1990)	Grab samples	10 parameters[10]	Good/Fair/Poor						•Fairland Rd (GOOD) •Rt. 29 (FAIR)
	1990	ICPRB (Cummins et.al., 1991)	Grab samples	6 parameters[11]	No rating provided						•Randolph Rd[10]
	1994-1996	MCDEP	Grab samples	4 parameters	Supports biological monitoring						

1. RBP III (EPA's Rapid Bioassessment Protocol, level III) is a genus level study on the benthic macroinvertebrate (aquatic insect) community, which entails scoring 6 different macroinvertebrate community attributes (metrics) at each site and comparing those scores to a reference (best condition) site to get a consistent assessment of all sites in the study. MWCOG examined the RBP III data collected and analyzed by ICPRB in 1989 and then developed the stream condition characterization breakdown.

2. RBP II (EPA's Rapid Bioassessment Protocol, level II) is a family level study on the benthic macroinvertebrate (aquatic insect) community. The Environmental Planning Division analyzed data from the source indicated, which involved transposing a mix of genus and family level macroinvertebrate data into a consistent set of family level data for all the sites and then performing a RBP II (family level) analysis. The RBP II analysis entails scoring 7 different macroinvertebrate community attributes (metrics) at each site and comparing those scores to a reference (best condition) site to get a consistent assessment of all sites throughout the study.

3. Montgomery County DEP established a Biological Monitoring Work Group in 1994. Monitoring protocols reviewed by this Group are used by various County agencies to monitor County streams.

4. Fish diversity comparisons involved comparing the diversity of fish communities from different stream sites throughout the Anacostia River basin. Ratings are based on a MWCOG breakdown: 0 - 5 fish species = POOR, 5 - 10 species = FAIR, 10 - 15 species = GOOD, 15 - 25 species = EXCELLENT.

5. RBP V is a species level analysis on the fish community. An Index of Biological Integrity (IBI) is an analysis procedure, similar to RBP II & III, which involves assigning values for 8 different fish community attributes (metrics) for each site, and then comparing those values to a reference (best condition) site to get a consistent and standardized assessment for all sites throughout the study.

6. The 9 parameters assessed by MCDEP in the years 1972 through 1975 included; mean water temperature, mean dissolved oxygen, mean pH, mean biochemical oxygen demand (BOD), mean turbidity, mean total coliform, mean fecal coliform, mean total nitrate/nitrite, and mean total phosphates. Stream condition characterization for 1972 through 1975 was based on a combination of assessments and comparisons of the average values of the 9 water quality parameters for all the sites on each stream, which included; assessing violations of State water quality criteria, assessing sites which exhibited poor water quality, comparisons of the various parameters between streams, and professional judgement of DEP staff.

7. The 9 parameters assessed by MCDEP in the years 1976 through 1980 included; mean water temperatures, mean dissolved oxygen, mean pH, mean BOD, mean total phosphates, mean nitrate/nitrite, mean turbidity, mean total suspended solids, and mean fecal coliform bacteria concentrations. Stream condition characterization for 1976 through 1980 was based on a Water Quality Index (for further information and explanation see the MCDEP Environmental Reports for those years or see the EPA publication: EPA-907/9-74-001, Feb 1974).

8. The 4 parameters assessed by MWCOG in 1985 included; mean total suspended solids, mean fecal coliforms, mean nitrate, mean total phosphorous concentrations. Stream condition characterization was based on professional judgement.

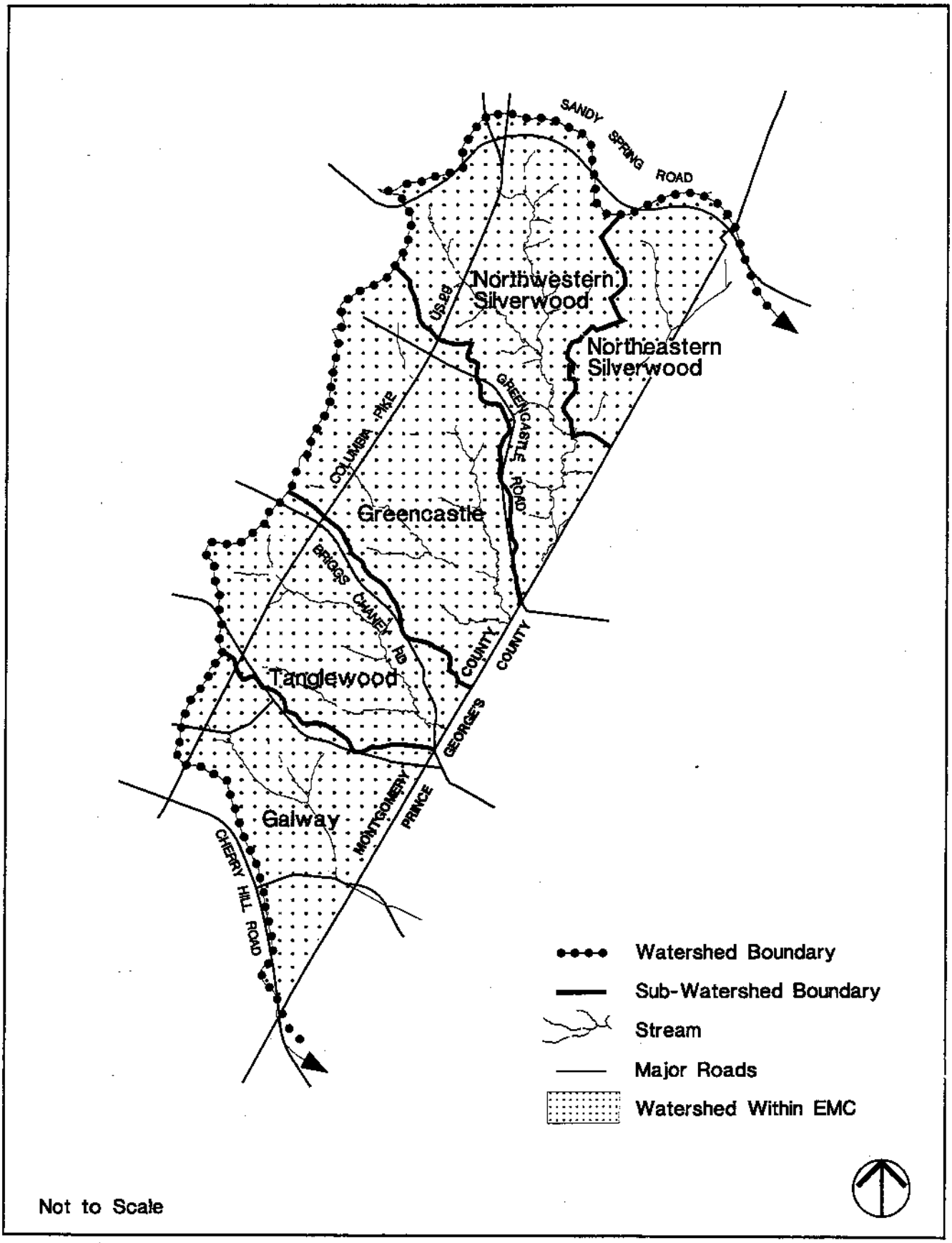
9. The 4 parameters collected by ICPRB in 1988 included; water temperatures, pH, dissolved oxygen, and conductivity. No stream rating or characterization was furnished in the study report, however a discussion of the relative significance of the values of the 4 parameters was provided in the report and is summarized in the following: the Rt 29 site had temperatures, pH, and conductivity levels which were normal in spring, summer, and fall, but the dissolved oxygen level was low in summer while normal in spring and fall.

10. The 10 parameters assessed by ICPRB in 1989 included; mean water temperature, mean dissolved oxygen, mean pH, mean turbidity, mean total suspended solids, mean total dissolved solids, mean ammonia, mean conductivity, mean total coliforms, and mean fecal coliform. Stream condition characterization was based on professional judgement.

11. The 6 parameters assessed by ICPRB in 1990 included; water temperature, pH, total dissolved solids, turbidity, dissolved oxygen, and coliform bacteria concentrations. No stream rating or characterization was furnished as part of the study report, however a discussion of the relative significance of the values was provided in the report and is summarized in the following; the Randolph Rd site had pH levels which were mostly normal throughout the year but high in July, the Total Dissolved Solid levels were normal all year, the turbidity levels were normal all year, the dissolved oxygen levels were normal all year, the temperature levels were normal all year, the coliform concentrations chronically met or exceeded the recommended limit set in State water quality standards.

Little Paint Branch

Figure 8



Summary of Little Paint Branch Water Quality Monitoring

Table 6

Parameters Studied	Year of Data Collection	Agency (Source)	Sampling Method	Analysis Method	Stream Condition Characterization	Little Paint Branch Subwatersheds			
						Galway Trib.	Tanglewood Trib.	Greencastle Trib.	Mainstem
Macro-invertebrates	1989	MWCOG (Kumble, 1990)	Surber, 2 sq. ft.	Modified RBP III; 6 metrics[1]	Good/Fair/Poor				•Briggs Chaney Rd (FAIR)
	1990	ICPRB (Cummins et. al., 1991)	Surber, 2 sq. ft.	RBP II; 7 metrics. EPD analysis[2]	Excellent/Good/ Fair/Poor		•Upstream of Briggs Chaney Rd (POOR)		
	1993	M-NCPPC EPD (1993)	D-net, 300 seconds	RBP II; 7 metrics. EPD analysis[2]	Excellent/Good/ Fair/Poor	•Downstream of East Fairland/Calverton Park (POOR)	•Upstream of Briggs Chaney Rd (FAIR)	•Upstream of Pitcairn Place (FAIR)	
Fish - (excludes MD. DNR data)	1988	MWCOG (Herson et. al., 1989) ICPRB (Cummins, 1989)	Seine hauls	Fish diversity comparisons. MWCOG ratings[3]	Excellent/Good/ Fair/Poor				•Briggs Chaney Rd (FAIR)
	1990	ICPRB (Cummins et. al., 1991)	Electroshock	RBP V; IBI, 8 metrics[4]	Excellent/Good/ Fair/Poor		•Upstream of Briggs Chaney Rd (FAIR)		
Chemical and Physical Water Quality	1985	MWCOG (1987)	Grab samples	4 parameters[5]	Good/Fair/Poor				•Near Briggs Chaney Rd (FAIR)
	1986 & 1987	MWCOG (1989a)	Grab samples	5 parameters[6]	Excellent/Good/ Fair/Poor				•Near Briggs Chaney Rd (POOR-FAIR)
	1988	ICPRB (Cummins, 1989)	Grab samples	4 parameters[7]	No rating provided				•Briggs Chaney Rd[7]
	1989	ICPRB (Stribling et. al., 1990)	Grab samples	10 parameters[8]	Good/Fair/Poor				•Briggs Chaney Rd (FAIR)
	1990	ICPRB (Cummins et. al., 1991)	Grab samples	6 parameters[9]	No rating provided		•Upstream of Briggs Chaney Rd[9]		

1. RBP III (EPA's Rapid Bioassessment Protocol, level III) is a genus level study on the benthic macroinvertebrate (aquatic insect) community, which entails scoring 6 different macroinvertebrate community attributes (metrics) at each site and comparing those scores to a reference (best condition) site to get a consistent and standardized assessment of all sites throughout the study. MWCOG examined the RBP III data collected and analyzed by ICPRB in 1989 and then developed the stream condition characterization breakdown.

2. RBP II (EPA's Rapid Bioassessment Protocol, level II) is a family level study on the benthic macroinvertebrate (aquatic insect) community. The Environmental Planning Division analyzed data from the source indicated, which involved transposing a mix of genus and family level macroinvertebrate data into a consistent set of family level data for all the sites and then performed a RBP II (family level) analysis. The RBP II analysis entails scoring 7 different macroinvertebrate community attributes (metrics) at each site and comparing those scores to a reference (best condition) site to get a consistent and standardized assessment of all sites throughout the study.

3. Fish diversity comparisons involved comparing the diversity of fish communities from different stream sites throughout the Anacostia River basin. Ratings are based on a MWCOG breakdown: 0 - 5 fish species = POOR, 5 - 10 species = FAIR, 10 - 15 species = GOOD, and 15 - 25 species = EXCELLENT.

Summary of Little Paint Branch Water Quality Monitoring

4. A RBP V (EPA's Rapid Bioassessment Protocol, level V) is a species level study of the fish community. An Index of Biological Integrity (IBI) is used as an analysis procedure, similar to RBP II & III, which involves assigning values for 8 different fish community attributes (metrics) for each site, and then comparing those values with a reference (best condition) site to get a consistent and standardized assessment for all sites throughout the study.

5. The 4 parameters assessed by MWCOG in 1985 included; mean total suspended solids, mean fecal coliforms, mean nitrate, mean total phosphorous concentrations. Stream condition characterization was based on professional judgement.

6. The 5 parameters assessed by MWCOG in 1986 & 1987 included the mean values from May through September for; water temperature, pH, total suspended solids, fecal coliform, and nitrate. The stream condition characterization was based on a water quality index developed by ICPRB in 1979 which assigns a score for the mean for each parameter, adds the scores to get a total score and then based on this total score assigns a rating for the particular sample site.

7. The 4 parameters collected by ICPRB in 1988 included; water temperatures, pH, dissolved oxygen, and conductivity. No stream rating or characterization was provided in the study report, however a discussion of the relative significance of the values of the parameters was provided in the report and is summarized for the Briggs Chaney Rd site in the following: water temperatures and conductivity were relatively normal in spring and summer; pH was low in spring, summer and fall; dissolved oxygen was very low in summer, but normal in spring, no fall reading.

8. The 10 parameters assessed by ICPRB in 1989 included; mean water temperature, mean dissolved oxygen, mean pH, mean turbidity, mean total suspended solids, mean total dissolved solids, mean ammonia, mean conductivity, mean total coliforms, and mean fecal coliform. Stream condition characterization was based on professional judgement.

9. The 6 parameters assessed by ICPRB in 1990 included; water temperature, pH, total dissolved solids, turbidity, dissolved oxygen, and coliform bacteria concentrations. No stream rating or characterization was provided in the study report, however a discussion of the relative significance of the values of the 6 parameters was provided in the study report and is summarized in the following: the Little Paint Branch tributary site which was upstream of Briggs Chaney Rd had water temperatures within normal limits during June through October; pH was generally within normal limits from June through October except for July when it was very high; total dissolved solids were within normal limits from June through October; turbidity was generally within normal limits from June through September, however in October it was slightly elevated; dissolved oxygen levels were within normal limits from June through October; total and fecal coliform concentrations were relatively normal during April, July and October but were excessively high during May, June, August and September.

Freshwater Fish Collected in Little Paint Branch in Fairland Recreational Park, 1990-1991

Table 7

Fish Species	Trophic Level	Pollution Tolerance
Blacknose Dace *(Rhinichthys atratulus)*	Generalist	Tolerant
Rosyside Dace *(Clinostomus funduloidess)*	Insectivore	Intermediate
Longnose Dace *(Rhinichthys cataractae)*	Insectivore	Intolerant
Central Stoneroller *(campostoma anomalum)*	Herbivore	Intermediate
Cutlips Minnow *(Exoglossum maxillingua)*	Omnivore	Intermediate
Fallfish *(Semotilus corporalis)*	Generalist	Intermediate
Creek Chub *(Semotilus atromaculatus)*	Generalist	Tolerant
Common Shiner *(Luxilus cornutus)*	Insectivore	Intermediate
Spottail Shiner *(Notropus budsonius)*	Insectivore	Intermediate
American Eel *(Anguilla rostrata)*	Piscivore	Intermediate
White Sucker *(Catostomus commersoni)*	Omnivore	Tolerant
Northern Hog Sucker *(Hypentelium nigricans)*	Insectivore	Intolerant
Margined Madtom *(Noturus insignis)*	Insectivore	Intermediate
Tessellated Darter *(Etheostoma olmstedi)*	Insectivore	Tolerant
Green Sunfish *(Lepomis cyanellus)*	Invertivore	Tolerant
Bluegill *(Lepomis macrochirus)*	Insectivore	Tolerant
Pumpkinseed *(Lepomis gibbosus)*	Invertivore	Tolerant
Rock Bass *(Ambloplites rupestris)*	Piscivore	Intermediate
Largemouth Bass *(Micropterus salmoides)*	Piscivore	Tolerant

Sources - M-NCPPC, Department of Park and Planning, Natural Resources Division
- Trophic level and pollution tolerance categories from information compiled by Keith Van Ness, MCDEP.

impacts that range from concrete channelization of a stream section within the older Calverton subdivision to inadequate or non-existent stormwater management and stream buffers and removal of much forest or vegetative cover during development.

There are, however, some streams in the Little Paint Branch watershed which are still of relatively good quality. The streams in the Silverwood subwatershed (including the small tributary that flows through McKnew Local Park and the northwestern Silverwood Tributary that traverses Fairland Recreational Park) appear to be of relatively good quality with the exception of the portion of the northeastern tributary below McKnew Local Park to the confluence with the northwestern tributary. This section has been degraded by existing land uses which have resulted in extensive sediment input, loss of undisturbed stream buffers, and in-stream wet ponds (see Figure 8, page 39). The Silverwood tributary sub-watershed has the lowest imperviousness (15.1 percent) of the Little Paint Branch subwatersheds in Montgomery County.

The good quality of some of the streams in the Silverwood subwatershed are not reflected in Table 6, page 40. Rather these conditions are indicated by some limited monitoring of the stream by M-NCPPC staff:

- Limited fish data collected by Parks staff in 1991, which showed a diverse fish community, and qualitative observations of the northwestern tributary and the mainstem between the confluence with the northwestern tributary to the County line, indicated that this tributary and the part of the mainstem below the tributary are high quality Use I streams. Table 7, page 42, lists the fish species that were collected. A summary of the aquatic resources identified through this monitoring effort can also be found in the Master Plan for Fairland Park. The high quality conditions of this tributary appear to still exist, based on a very limited quantitative sample of the macroinvertebrate community conducted in January 1996 at one station by M-NCPPC staff.
- The northeastern tributary (also known as the mainstem) appears to have high water quality in its upper section, from its origin in McKnew Local Park to roughly its intersection with the Columbia Gas Pipeline right-of-way. This evaluation was based on qualitative observations of the upper section of the tributary. A qualitative sample of the macroinvertebrate community in McKnew Local Park by M-NCPPC staff in January 1996, although very limited, supports staff's earlier evaluation: this part of the tributary has an unusually rich macroinvertebrate community, indicating high water quality.

Because some of the streams in the Silverwood subwatershed appear to be of good quality, these stream conditions should be preserved. A high level of protection is recommended for these streams to help maintain stream quality. Such measures could include, but would not be limited to, encouraging cluster development to protect environmentally-sensitive areas, park ownership of stream buffer areas and adjacent steep slopes, preservation of large high quality forest stands beyond the minimum required under the forest conservation law. In addition, land uses that minimize new impervious cover, given the existing land uses already in place, and that encourage clustering away from stream buffers, steep slopes, and forested areas should be put in place.

The degraded section of the northeastern tributary within the Silverwood subwatershed is one area of Little Paint Branch that should be identified for restoration and improvement to correct existing problems. New development in this area should incorporate stormwater retrofit and/or stream enhancement measures, as well as measures to comply with standard environmental protection requirements and guidelines.

In addition, the Little Paint Branch streams that drain land south of Greencastle Road are of lower quality. The relatively high impervious cover of the land that they drain (ranging from about 23.5 to 29.7 percent in 1990) reflect the higher level of stressed conditions that result in lower quality in these streams. The strategy for protecting these streams should focus on minimizing further degradation through stringent implementation and enforcement of regulatory environmental requirements, standards, and guidelines. In addition, timely identification and implementation of stormwater management retrofit and stream restoration projects within the watershed are needed.

Water Quality in the Patuxent River Basin

Data that documents the health and condition of the Patuxent watershed streams in eastern Montgomery County is sparse. Limited data on aquatic macroinvertebrate stream habitat data (Table 8, page 44), however, indicate that these streams are generally of high quality. The generally low density development that has occurred in the watershed, which is reflected in the low impervious cover (see Table 2, page 20), has aided in preserving the very good conditions of the streams (see Figure 9, page 45).

Areas of localized degradation do exist on some of the streams. For example, the headwaters of two

streams that drain the northwest quadrant of the Burtonsville commercial area have been degraded. Much of the development in this commercial area predates stormwater management requirements and stormwater runoff from these uses is largely uncontrolled. This situation has resulted in severe channel erosion in the upper reaches of the tributary north of the elementary school and possibly degraded water quality in the upper reaches of these two streams.

The Rocky Gorge reservoir experiences some eutrophication due to nutrients and sediment trapped by settling action in the reservoir. Over time, the reservoir collects pollutants and sediments, decreasing its storage capacity, water quality and aquatic habitat.

The Patuxent River Commission and Maryland Department of State Planning in cooperation with all seven Patuxent watershed counties developed the Patuxent River Policy Plan in 1984. This plan arose from the need to restore water quality in the Patuxent and the Chesapeake Bay, to address non-point sources of pollution from a regional perspective and to protect the two reservoirs on the Montgomery-Howard County border. Approval of the plan by the seven counties and the General Assembly signified their agreement to accord special management and planning consideration to lands bordering watershed streams. The jurisdictions

Summary of Patuxent River Watershed Studies

Table 8

Parameters Studied	Year of Data Collection	Agency (Source)	Condition of Various Tributaries to the Patuxent River
Macro-invertebrates and stream habitat	Summer 1993	M-NCPPC – EPD (1993)	• Oak Hill Road Tributary — (EXCEL) • Kruhm Road Tributary — (EXCEL) • Aitchson Lane Tributary — (EXCEL)

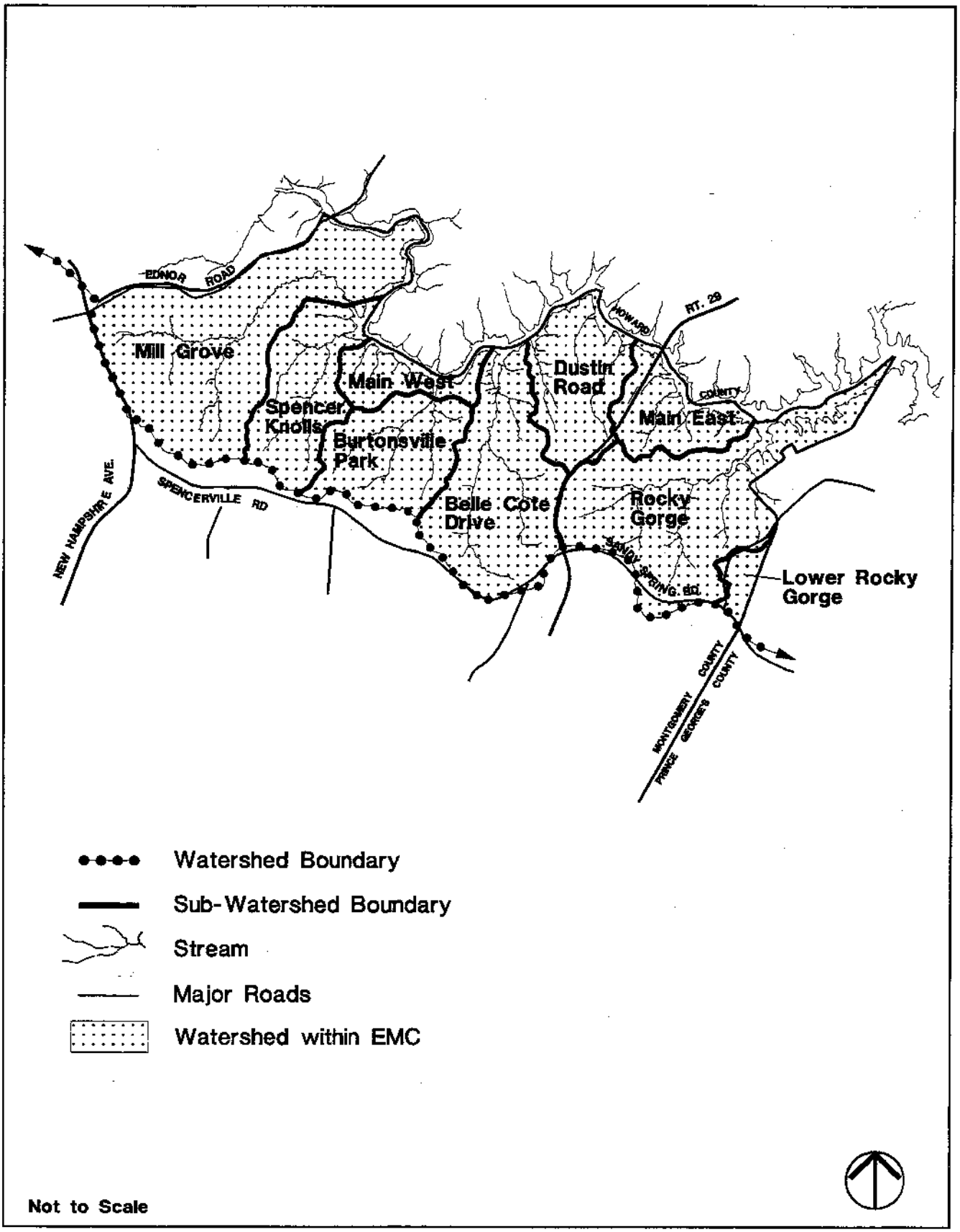
Sampling Method	Analysis Method	Stream Condition Characterization
D-net 300 seconds	RBP II; 7 metrics. EPD analysis[1]	Excellent/Good/Fair, Poor with respect to a reference site

Parameters Studied	Year of Data Collection	Agency (Source)	Condition of Various Tributaries to the Patuxent River
Macro-invertebrates, Stream Habitat, and Land Use habitat	Spring and Fall 1995	M-NCPPC – EPD (1996)	1. Kingdom Hall Tributary — Macroinvertebrates: spring/moderately impaired, fall/moderately impaired. Stream habitat: spring/slightly impaired, fall/slightly impaired. 2. Burtonsville Shopping Center Tributary — Macroinvertebrates: spring/severely impaired, fall/severely impaired. Stream habitat: spring/severely impaired, fall/severely impaired 3. Santini Road Tributary — Macroinvertebrates: spring/severely impaired, fall/moderately impaired. Stream habitat: spring/moderately impaired, fall/moderately impaired. 4. Magnolia Road Tributary — Macroinvertebrates: spring/slightly impaired, fall/moderately impaired. Stream habitat: spring/slightly impaired, fall/moderately impaired. 5. Ednor Park Tributary — Macroinvertebrates: spring/slightly impaired, fall/slightly imparied. Stream habitat: spring/non-imparied, fall/non-impaired. 6. Burtonsville Power Lines Tributary — Macroinvertebrates: spring/moderately impaired, fall/slightly impaired. Stream habitat: spring/slightly impaired, fall/slightly impaired 7. Foxes Branch Tributary (reference site) — Macroinvertebrates: spring/non-impaired, fall/non-impaired. Stream habitat: spring/non-imparied, fall/non-impaired.

Sampling Method	Analysis Method	Stream Condition Characterization
D-net 300 seconds	RBP II; 7 metrics. EPD analysis[1]	Excellent/Good/Fair, Poor with respect to a reference site

Patuxent River

Figure 9



also committed to develop and implement the primary management area approach in the Patuxent watershed. There are on-going efforts to protect and enhance water quality in the Patuxent through the efforts of the Patuxent Tributary Strategy as part of the Chesapeake Bay restoration effort, the U.S. Army Corps of Engineers Patuxent River Watershed Resources Study, the Patuxent Reservoir Group and the Patuxent Demonstration Project.

In the Patuxent watershed, the M-NCPPC environmental management guidelines call for a transition area beyond the regulatory stream buffer. Low zoning densities or conservation uses are recommended for this primary management area (PMA). Development will be accommodated in ways which minimize impacts on water quality and maximize the protection of existing environmental features. There is a 10 percent imperviousness limit for new development which contains the PMA. Also, the master plan recommends at least fifty feet of forest be maintained along all streams. If the achievement of other planning objectives necessitates a deviation from these policies, extraordinary protection measures should be implemented to mitigate the additional disturbance and development[5].

Under the 1981 master plan zoning, impervious cover of the subwatersheds of the Patuxent River within eastern Montgomery County are projected to lie between 4.4 and 12.2 percent. These projections fall within the generally accepted limits for coldwater streams in Maryland. These land uses, in combination with strict implementation of regulatory environmental requirements, standards, and guidelines, including the PMA, are expected to provide appropriate protection for the aquatic resources of the Patuxent.

Sensitive Areas Protection

The Maryland Economic Development, Resource Protection, and Planning Act of 1992 established seven visions for the state, including the protection of sensitive areas. The Act requires the implementation of a "sensitive areas element" designed to protect streams and their buffers, one-hundred year floodplains, steep slopes and the habitats of threatened or endangered species, as well as any particular resources the locality deems appropriate.

The master plans take presence and amount of sensitive areas into account in their land use proposals. Many of these areas in eastern Montgomery County are already within parkland, and more are proposed for park acquisition. In areas where development is planned that includes sensitive areas, site-specific design and layout of a development project are addressed through the County development review process. This includes the application of M-NCPPC environmental guidelines, which provide for undisturbed stream buffers that include steep slopes,

[5] See the Functional Master Plan for the Patuxent Watershed (1993) and the Guidelines for Environmental Management of Development in Montgomery County, both of which are available from the Montgomery County Department of Park and Planning.

Local Environmental Regulatory Responsibilities

Table 9

Agencies that review environmental issues for subdivision and site plan development in Montgomery County include:

MCDPS	Montgomery County Department of Permitting Services. Its role is to provide "one-stop-shop" for regulatory permitting and protection as part of development and growth activities. It handles permitting for stormwater management, floodplain management and sediment control from construction sites. The Well and Septic Section reviews and approves systems for private drinking water supplies (wells) and private sewage disposal systems (septic tanks and fields).
MCDEP	Montgomery County Department of Environmental Protection. MCDEP is responsible for implementing the County's water quality ordinance including monitoring water quality and pollutants from point and non-point sources, and is responsible for the County's stormwater discharge program under the NPDES provisions of the federal Clean Water Act. In Special Protection Areas, MCDEP assists MCDPS in setting performance goals for stormwater management associated with new development. MCDEP is also responsible for water and sewerage systems planning.
M-NCPPC	Maryland-National Capital Park and Planning Commission. The Environmental Planning Division (EPD) is part of the M-NCPPC Department of Park and Planning which provides staff for the County Planning Board. EPD oversees natural resource identification and protection through its environmental planning role at both the long-range master plan level and the short-term regulatory level. EPD arbitrates both the boundary and the permitted uses and encroachments into stream buffers as part of the M-NCPPC environmental guidelines. EPD also administers the county forest conservation law.
MCDPWT	Montgomery County Department of Public Works and Transportation. MCDPWT designs, constructs and maintains the county's public roads and public drainage systems and manages the County's solid waste program.
WSSC	Washington Suburban Sanitary Commission. This is a bi-county agency(Montgomery and Prince George's Counties) responsible for design, construction and maintenance of the pipes and facilities needed for providing public drinking water and sewage.

floodplains, wetlands and unique habitats, and DEP's County stormwater management and sediment/erosion control standards. Table 9 lists some of the local agencies who review development plans for environmentally related issues.

The U.S. Army Corps of Engineers, the U.S. Environmental Protection Agency and the U.S. Fish and Wildlife Service are all involved nationally in the protection of sensitive areas under various parts of the Clean Water Act; Maryland Department of the Environment administers state wetlands and water quality certification permits. These federal and state agencies also assist local governments in identifying suitable wetland restoration projects and conducting functional assessments of existing wetlands.

Habitat Preservation and Forest Conservation

The riparian system of streams, wetlands and stream valley forests is the major type of habitat in eastern Montgomery County. The stream valley areas already protected in parkland make up a considerable corridor spatially, but the extent to which this area adequately supports biological functions (and hence bio-diversity) of the habitat must also be considered. This involves protecting recharge areas and wetlands from development or other stress, while monitoring and improving physical, chemical and biological stream conditions on both public and private lands.

The health of stream valley habitats is influenced by conditions in upland areas. These areas have traditionally been subject to development pressures, first from agricultural uses, then from roads and crossroad communities located along the ridges. The major recharge areas for groundwater and wetlands are in the uplands where soils are most permeable. Upland forests also connect wildlife migration paths between the stream valleys. Additionally, upland meadows provide habitat for flora and fauna which can only thrive here, such as the Sedge Wren. These upland areas are particularly vulnerable because they are generally viewed as having the least environmental value and therefore are considered ideal for development disturbance.

The brown trout population is dependent upon upland recharge areas to support stream baseflow and temperature requirements, though the extent of its reliance is unknown at this stage. There are presently approximately 3,430 undeveloped acres in Montgomery County's Paint Branch watershed, 2,600 acres of which are forested. About 75 percent of this forested land is protected as parkland. Most of the forested land not in parkland is located north of Fairland Road.

The mature, mixed deciduous lowland forests, such as in parts of upper Paint Branch and McKnew Park, contain a diverse herbaceous layer which is matched in no other habitat. Hundreds of species can occur over small areas, and in places the soil is completely hidden by this lush growth. These areas where species diversity is high, offer the best opportunity for finding and preserving rare plant and animal species, and are instructive to natural resource managers in evaluating desirable conditions for fostering bio-diversity.

Forest conservation helps retain the natural beauty of the community and protects dependent ecosystems. Trees provide shade to ameliorate summer temperatures, to provide cover and food for a variety of wildlife and cleanse the air and runoff. Since 1992, Montgomery County has been requiring forest conservation as part of applications for land disturbance and development. The County's forest conservation law is required by and modeled after the Maryland Forest Conservation Act of 1991. Forest conservation recognizes the benefits of forest and trees in our increasingly urbanized environment and requires preservation and reforestation as part of the development process.

Urban forest and tree preservation often is intended to meet the needs of people as much as the environment. Frequently, woods in developed areas are isolated, invaded by exotic vegetation and in poor health. Some individual trees are worthy of preservation, but they can be difficult to save given site and layout constraints. The forest conservation law encourages retention of existing trees wherever possible, as well as appropriate maintenance to keep them viable. Street trees, which enhance neighborhoods and buffer road noise, are an important part of beautification in the down-county. The master plans support programs for expanding and improving street tree coverage.

Within the Suburban Taxing District, the County's Department of Public Works and Transportation (MCDPWT) offers street tree maintenance along County roads, including pruning, spraying for insect/disease control and tree removal and replacement. Outside the Suburban Taxing District, MCDPWT can provide low-level service for storm damage cleanup, hazardous tree removal and safety pruning around traffic control devices. The Suburban Taxing District includes all the Four Corners planning area and part of the White Oak

planning area west of New Hampshire Avenue and south of Quaint Acres subdivision. The Fairland and Cloverly Planning Areas are outside the Suburban Taxing District.

Air Quality

Although there are various forms of air pollution, the major health concern in this region is ozone. Ozone is formed in the lower atmosphere when nitrogen oxides and volatile organic compounds (VOC) react in the presence of sunlight. These pollutants are largely attributable to gasoline fueling and combustion. Factors affecting ozone formation include VOC and oxides of nitrogen concentrations in the air, wind velocity, temperature, and sunlight. Ozone formation is greatest on hot, sunny, windless days. Adverse impacts of ozone include photochemical smog, vegetation damage, and health effects such as: coughing and chest pains, irritation of the eyes and throat, breathing difficulties, and greater susceptibility to infection.

The entire Washington Metropolitan Statistical Area (MSA), which includes all eastern Montgomery County, falls into the serious classification for ozone (0.160 - 0.180 ppm). The national ambient air quality standard for ozone is 0.120 part per million (ppm). On average, the region experiences 11 days per year during which this standard is exceeded. EPA permits only one such day per year. Although ozone affects all 3.9 million residents of the Washington metropolitan region, about one-third are especially at risk. This group includes children, the elderly, people with respiratory problems such as asthma, and a larger group that are ozone sensitive. EPA requires attainment of the federal standard by 1999, and more immediately, that the region achieve a 15 percent reduction of ozone precursors by 1996. If the region fails to achieve the standard, EPA may impose sanctions.

The Metropolitan Washington Air Quality Committee (MWAQC) is responsible for choosing the air pollution control measures to be implemented by the region and for preparing the region's air quality plans. It was formed under the combined authority of the mayor of Washington, D.C. and the governors of Maryland and Virginia. These plans are forwarded to the governors and the mayor for inclusion in the State Implementation Plans they submit to EPA.

On November 15, 1990, the Clean Air Act Amendments of 1990 became law. They embody fundamental legislative changes, and significantly alter the approach for meeting air quality standards in non-attainment areas. Control measures target two sources of pollution: mobile and stationary sources. Mobile sources are generally internal combustion engines. Stationary sources cover a wide range of structures such as smoke stacks, gaseous industrial exhaust and activities involving combustion or the use of highly volatile substances as in the use of aerosols, varnishes, incinerators and backyard barbecues.

Regulations that will reduce pollution from mobile sources are called transportation control measures (TCMs). Reduction of emissions from single occupancy vehicle (SOV) travel is the main focus of the County. One of the most effective measures is a balanced employer trip reduction program, which would require all employers or building owners to charge SOV drivers for parking. The proceeds would be used to fund incentives for employees that use alternative modes. Another measure would require the adoption of pedestrian- and transit-oriented design standards in all land use zones in order to improve access to alternative forms of transportation. The MWAQC has also identified several technological measures aimed at reducing automobile emissions. These include controls on gasoline formulation and enhanced inspection and maintenance of vehicles.

Public Utilities and Solid Waste

Water Supply

WSSC manages and supplies the principal sources of drinking water for eastern Montgomery County. Water is drawn from the Potomac and Patuxent rivers, treated and distributed throughout Montgomery and Prince George's Counties.

The water distribution system is divided into zones, which denote the pressurized system in which certain areas are served. The Four Corners area is served by the Montgomery County Main Zone. White Oak service is split between the Main and the High (Colesville service area) Zones. There is a pump/storage facility at Notley Road west of New Hampshire Avenue. Fairland is entirely within the High Zone (Colesville and Browns Corner service area). Cloverly is served entirely by the Browns Corner service area, part of the High Zone. Cloverly also has a standpipe at MD 198 and New Hampshire Avenue. There is presently a need for additional storage facilities in the High Zone. Two locations have been chosen on the Hampshire Greens property in Cloverly and on the WSSC Composting Facility Site in Fairland.

Well water is primarily used in the northern portions of Cloverly and Fairland, although there may be isolated users in areas currently eligible for WSSC service. It is not mandatory for well users to obtain WSSC service; however, many choose to receive the service over time.

Sewerage Systems

Sewer service in eastern Montgomery County is primarily provided via WSSC. Sewage is collected and transported to the Blue Plains regional wastewater treatment facility in the District of Columbia. Septic systems are primarily used in the northern portions of both Cloverly and Fairland, although there may be isolated users in areas currently served by WSSC. It is not mandatory for septic system users to obtain WSSC service within the service area, but many do eventually connect to community sewer lines.

All eastern Montgomery County on community sewer is served by two main service basins: Northwest Branch and Paint Branch. White Oak and Cloverly are served by both basins. Fairland is served by Paint Branch and Little Paint Branch—a sub-basin that also serves Prince George's County. All the service in Fairland, White Oak and Cloverly is via gravity.

Future service will also be extended via gravity in these basins. There are no WSSC sewer facilities in the Patuxent basin and none are planned. It is possible that sewer relief may be necessary in Paint Branch downstream of Colesville Road. The Northwest Branch trunk sewer between Randolph Road and Colesville is expected to have capacity constraints in the future.

WSSC's *Rock Creek Wastewater Facility Plan* is currently underway and will investigate alternatives for eliminating future capacity limitations in the wastewater conveyance system for the Rock Creek basin. One of the plan's possible alternatives is to pump flows from the Rock Creek sewer basin into Northwest Branch's sewer lines. This would significantly increase the number of Northwest Branch lines that will have future wastewater capacity constraints, as well as possibly accelerate the need for projects to address these contraints. The actual nature, extent and timing of any projects in these basins will be determined through the County's *Comprehensive Water Supply and Sewerage Systems Plan* and WSSC's CIP.

Solid Waste Management

Montgomery County's waste management system is founded on the four part preference of reduce, recycle/re-use, incinerate and landfill, as recommended by the U.S. Environmental Protection Agency and the Maryland Department of the Environment. The major components of the system are contained in the County's *Ten Year Solid Waste Plan*. This functional plan sets forth the goals and objectives of the County with regard to solid waste management. The goal most relevant to eastern Montgomery County is that of 50 percent waste recycling by the year 2000. This recycling goal will be largely met through establishment of a yard trim program, now underway, and expansion of the existing recycling program to include low-grade paper. This expansion will aid in achievement of the 50 percent goal.

Noise

The Department of Park and Planning defines noise simply as unwanted sound. Although this definition would suggest that the effects of noise vary based on an individual's sensitivity to, or feelings about a sound, medical evidence has shown that long-term exposure to excessive noise can have serious physical health effects regardless of the perception. Between 55 and 65 dBA[6] Ldn[7], humans experience increased levels of interference with speech and communication.

In Montgomery County, government agencies have the authority to control two of the most prevalent types of noise, stationary and mobile (i.e., transportation-related) sources. The Montgomery County Noise Ordinance regulates stationary noise sources such as heating and air conditioning units, construction activity and neighborhood noise annoyances. The Planning Department, through Master Plan and regulatory review of plans, tries to protect residential properties from mobile source noise.

In 1983 the Planning Board adopted the "Staff Guidelines For The Consideration Of Transportation Noise Impacts In Land Use Planning And Development." This document was developed to assure consistency in master plan recommendations and noise analysis of regulatory reviews, and to promote greater

[6] A measure of decibel levels, weighted (using "A" weighting) for sounds that affect the human ear.

[7] Decibel levels measured over a 24-hour period, with nighttime noise weighted more heavily.

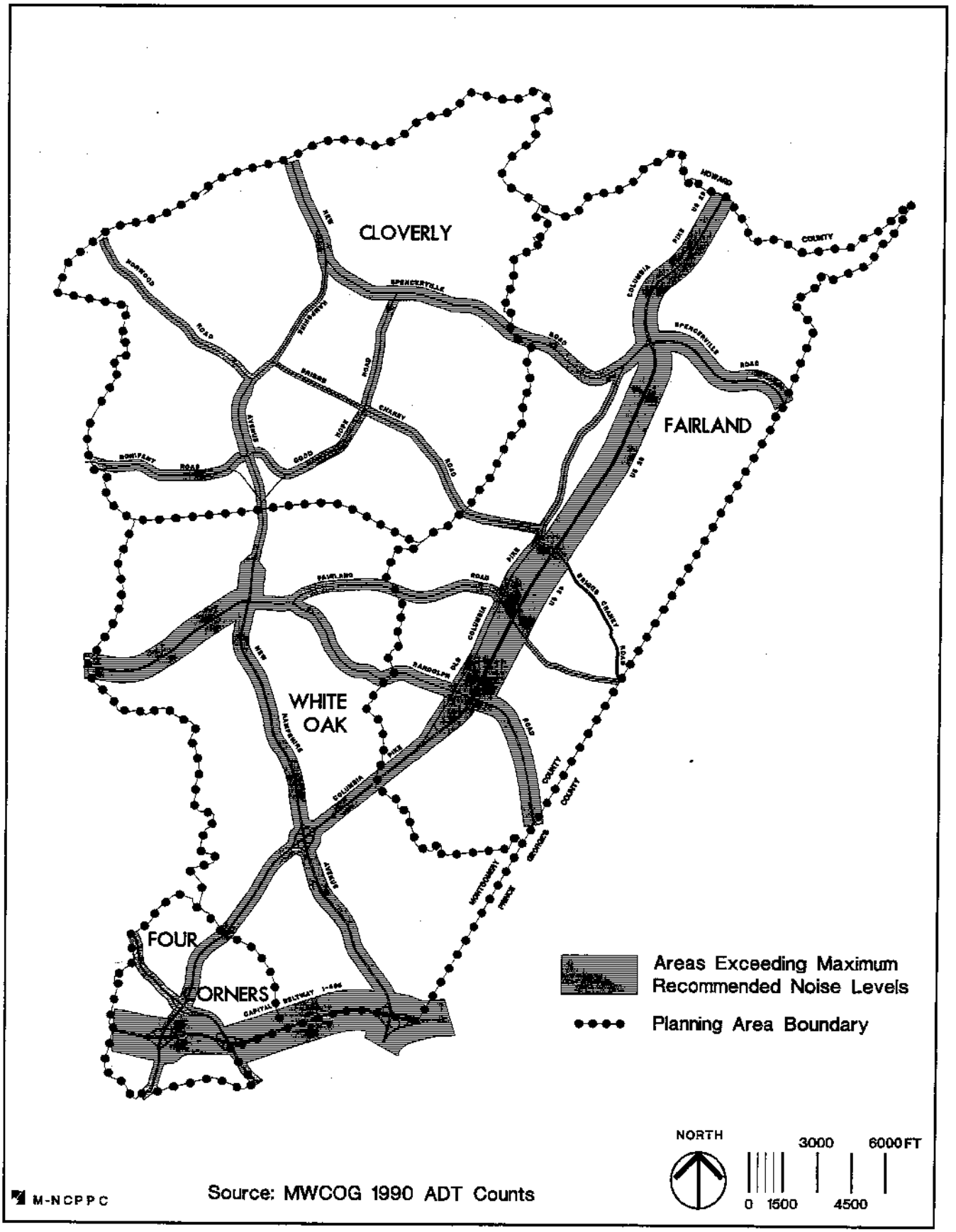
understanding of this issue by developers and planners alike. Unlike the County Noise Ordinance, these are guidelines only and are used to identify areas where transportation noise impacts may affect planning, and site design. The guidelines identify appropriate noise level goals based upon population density and traffic volumes within the County. A goal of 65 dBA was determined to be an achievable goal for the higher population density areas in the urban core. In the suburban "ring" around the urban core, staff determined that the 60 dBA level was an achievable goal, given lower traffic volumes and lower population densities. In the rural areas of the County where traffic volumes are much lower and lot sizes are larger, the 55 dBA level guideline is applied.

During the preparation of the Eastern Montgomery County Master Plans, major roadways were analyzed in an attempt to identify those properties with potential excessive noise levels. Existing and proposed noise levels illustrated in Figures 10 and 11, pages 51 - 52, are shown as a worst case scenario; the actual area of impact is lessened by berms, hilly topography, buildings and other physical barriers. The guidelines identify several measures to alleviate traffic noise problems for those properties, including:

1) Noise-compatible land use,
2) Distancing the receiver from the source,
3) Blocking the path from source to receiver,
4) Sensitive site design, and
5) Acoustical treatment of buildings.

1990 Traffic Noise Impact Areas

Figure 10



Projected Traffic Noise Impact Areas

Figure 11